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Founded by HENRY E. SIGERIST

Editor—OWSEI TEMKIN

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HARVEY'S AND CESALPINO'S ROLE IN THE HISTORY OF MEDICINE

SIGISMUND PELLER

For almost 300 years a controversy has been going on as to whether or not William Harvey, called the father of experimental physiology, is the discoverer of the circulation of the blood. With Arcieri's book (1) and his reply (2) to Singer (3), the old discussion has again flared up. It is my contention that in the evaluation of Harvey both admirers and opponents err. Nolens volens they distort the role of experimentation and of quantitative reasoning in the revolution which gave birth to modern medicine. But, before entering into this discussion, let us shortly recall some of the facts known in the 16th century and the essential views which had to be disproved and rejected to make place for the present theory of circulation.

Of the arteries, veins, lymph- and chyliferous vessels, only the first two were known. In accordance with Galen, veins and arteries were looked upon as separate systems, always filled with blood which was moving in both of them. The two vessel systems were assumed to communicate with one another by invisible channels a) in the ventricular septum cordis, b) in the lungs, between the arteria venosa (= pulmonary vein) and the vena arteriosa (= pulmonary artery), and c) in the extrathoracical parts of the body either along the vessel branches or at their

ends. No conception existed as to the abundance of these anastomoses in and outside the thorax.

The venous blood was supposed to be manufactured in the liver, out of the ingesta carried to it by the portal vein. The liver distributed its blood through the vena cava and its branches and also through the portal vein to all parts of the body including the right heart.

Of the blood in the right heart, a part was supposed to pass through the afore-mentioned invisible interventricular channels to the left heart, while another portion was thrown into the pulmonary artery in order to provide the lungs with the required nutritional elements. The function of the valves at the root of the pulmonary artery was known; they had to prevent regurgitation. In this artery the blood could not remain for long; it was pushed forward by two periodical forces. First, with each systole some new blood entered the artery and space had to be made for it. Second, with each expirium the intrathoracic space was reduced and, therefore, the pulmonary artery squeezed. Prevented from reflux, the blood was forced through the anastomoses into the pulmonary veins and, further, to the left heart where it joined the blood which had passed the septum.

By virtue of the heart's action venous blood became refined and, endowed with certain spirits, changed into arterial blood. The source of these spirits was seen in the inhaled air which according to the Alexandrian School entered the arteria venosa (= the pulmonary vein) through invisible communications in order to mingle with the blood. This theory was put to experimental proof by Leonardo da Vinci and refuted, for he was unable to see bubbles in the blood even when the air in the lungs was put under great pressure. The necessity of air for human and animal life was explained also in accordance with Aristotle: the bronchi and the inhaled air were looked upon as a cooling system for the pulmonary blood overheated by the heart's action. While serving its purpose in the bronchi or in the blood, respectively, the air was supposed to lose its refrigerating or vitalizing property or "elasticity" and, in order to be replaced, had to be exhaled together with the vapors received through the invisible channels via the pulmonary veins from the left heart and the arteries.

The mitral and aortic valves were known to hinder regurgitation of blood but were supposed to permit passage of vapors to the left atrium and to the pulmonary veins. The vapors and impurities of the arterial blood had also innumerable outlets in the periphery, through openings in the flesh and skin. Neither these openings nor those between the bronchi and the pulmonary vessels permitted the passage of blood. Under normal conditions this was also true for the anastomoses between the extra-

pulmonary arteries and veins. In accordance with Aristotle, it was believed that arterial blood was moving not only in the arteries but also in the nerves supposed to have a tubular structure.

The force behind the movement of the peripheral blood was obscure; partly it was the liver, partly attraction of the heart and of the generated spirits, while the heart as the central pump and motor was yet undiscovered. In the 1570's it was rediscovered that veins have valves but not before the 17th century did this become common knowledge. The genesis and propagation of the pulse and its relation to the heart's action were unknown.

Just as in earlier times Ibn al Nafīs, so in the Renaissance many a scientist, prominent among them Leonardo, Servetus, Colombo, Vesalius and Cesalpino, were aware of the confusion regarding blood, heart, blood vessels and lungs. By testing this or that detail of Galen's teachings, by supplementing knowledge through observation and experimentation and also by pure reasoning, they tried to overcome the confusion. Many mistakes, for instance, the permeability of the septum, were thus corrected and new facts in anatomy were discovered, e. g. the vein valves, and in physiology, e. g. the lesser circulation and the one-way movement of the venous blood. But all this work failed to enlighten the confused minds or do more than prepare the field for a new conception of the blood flow. Some of the discoveries were forgotten and rediscovered several times. This was so with the smaller circulation. Discoveries were accepted by some and discarded by others in spite of observational and experimental evidence. Thus, in 1651, in a letter to O. M. Slegel, Harvey felt obliged to disprove experimentally the permeability of the septum ventriculorum, although its impermeability was clearly recognized about 100 years earlier by Servetus,[1] Colombo and Vesalius.

Five ways could lead out of Galen's maze: *first*, the discovery of the relation of blood to nutrition and respiration, thus gaining an understanding of the perpetuum mobile created by nature; *second*, the visualization of the capillaries and of the blood flow in them, in various parts of the body in connection with the finding that in most veins blood moved only

[1] "... Fit autem communicatio haec non per parietem cordis medium, ut vulgo creditur, sed magno artificio. ..." (*Christianismi Restitutio*; De Trinitate, Liber V, p. 170.) *De Trinitate* was published in 1553. Some authors contend that Servetus is not the discoverer of the impermeability of the septum and of the lesser circulation, for, according to them, he was not an original worker, he was a compiler "from books" (Luciani (13)). However, the first books which could have served this purpose were those by Vesalius and by Colombo, published 2 and 6 years, respectively, after Servetus' death. The other arguments against Servetus are of similar nature.

centripetally; *third*, experimental evidence of the circulation by tracing substances injected into a bloodvessel; *fourth*, pure imagination that all blood from the peripheral arteries crosses over to the veins just as in the lungs all of it passes from the pulmonary artery to the veins; and *fifth*, quantitative reasoning concerning the amount of fluid involved in the uninterrupted movement of blood through the heart, making mandatory the way imagined under point four.

As long as the chemistry of gases and the physics of absorption and diffusion were rudimentary, the first way was not feasible. A glance into posthumous editions of v. Haller's textbook of physiology (4) proves that even as late as 1781, in spite of the progress made in the 17th and 18th centuries in the analysis of air and of the process of burning, opinions about respiration, about the admixture of air to the blood, about the factors responsible for the blood's temperature etc. were as confused as they were in the Renaissance. The second way had to wait for improved lenses, to be utilized by Malpighi, in 1661, and later by Spallanzani. The third way is linked with the name of Domenico Marchetti and the year 1655. As to the fourth way, I do not think that at the end of the 16th century anybody had the imagination necessary for so bold a departure from Galen. At least, there is no sign of it in the books of this time. Pondering over some of Cesalpino's writings, I often had the feeling, just as many before me, that his imagination carried him close to the discovery but that for some reason he stopped short of it.

According to Arcieri, Cesalpino experimented on, discovered and described the circulation in 1593 (5) and in the 19th and 9th chapters of the sixth book of his posthumous work, *Praxis Universae Artis Medicae* (6), in 1606, again presented it in " two clear and accurate descriptions of the greater and lesser circulation."

Let us scrutinize these two passages. They give a detailed description of what is called lesser circulation and of its purpose as understood in the 16th century. They deal with the transport of blood from the vena cava to the aorta through the pulmonary vessels, correctly interpreting the function of the valves, as was done before, for instance, by Leonardo da Vinci. They report on the gross anatomy of the pulmonary artery and vein. They refer to the then believed perfection of the blood in the ventricles of the heart and to the cooling function of the air that enters through the assumed communications between the two pulmonary vessels. Not a single word is devoted to the description of what happens to all the blood which has been dispersed from the aorta by way of arteries through-

out the body. Nor is there anything said in these two passages about the source or sources of the venous blood, which would lead us to believe that Cesalpino imagined the transfer from arteries to veins.

Therefore, the assertion is unwarranted that either one of these two passages proves the discovery of the so called greater or systemic circulation.

The last sentence of the first passage says: " Opposito modo in educentibus patent ad egressum, clauduntur ad ingressum, ut continuus quidam motus fieret ex venis in cor et ex corde in arterias." In Arcieri's translation this sentence reads: " The opposite happens with the expelling membranes, being patent at the egress (of the blood) in order to secure that the movement be continuous from the veins to the heart and from the heart to the arteries." Had Cesalpino continued: ' and in the periphery from the arteries to the veins and thence back to the heart,' as was later said by Harvey, the title to the discovery of the greater circulation would not be a matter of dispute. But, in the two passages of his last work and in his other books, Cesalpino dealt extensively with the part which had been clarified anatomically and to some extent physiologically [2] by Servetus (1553) and Colombo (1559), and failed even to touch on the crucial, unknown part, namely the *return* of the arterial blood from the periphery into the right heart through the veins.

In spite of resorting to vivisection experiments in which the direction of blood flow in the pulmonary blood vessels was correctly observed, Colombo and his ideas did not penetrate the minds of his contemporaries. They either ignored him or doubted the validity of his argumentation and, at the most, regarded his conclusions as hypotheses. This remained so for more than half a century. On the assumption that Colombo's work, although it was known even outside Italy,[3] was unknown to Cesalpino, the latter may be considered a rediscoverer of the lesser circulation.

Cesalpino accepted the existence of invisible anastomoses between arteries and veins in both the pulmonary and extrathoracic parts of the body. Upon opening a vein, he said, dark blood escapes followed by lighter, which is arterial blood that passed the anastomoses to enter the veins.[4] In this experiment some scientists saw one of the proofs that Cesalpino had discovered the systemic circulation. This argumentation would be valid, had he drawn conclusions from the experiment as to the

[2] That is, conversion of venous blood in the lungs into arterial blood.

[3] For instance, to Günther and to Roth.

[4] From clinical experience I concur with Willis (7) that the observation of a change in color is a mistake.

arterio-venous flow under *physiological* conditions. He did not. Neither is there any clear statement in his writings, nor any indication even in vague terms that this experiment served the understanding of physiological conditions. Cesalpino drew no more far-reaching conclusions than did Erasistratus and Galen, both of whom had postulated the existence of arterio-venous anastomoses and had known that an individual can be exsanguinated by opening either an artery or a vein. That was common knowledge since time immemorial, but had never inspired anybody to think of the blood flow in a closed circuit.

At variance with all before him, Cesalpino, in 1593, came to realize that in the veins blood flowed only in one direction, towards the heart. This discovery brought him so close to the conception of a circuit that some historians, Englishmen included, believed him to have "laid hold of the systemic circulation" (Foster (8)). They would be right, had he asked and answered from where the peripheral veins obtained their blood and how, in view of the one-way flow, blood manufactured in the liver reached the peripheral veins. Surprisingly, Cesalpino did not pose these questions. His finding that in veins blood did not move centrifugally, was irreconcilable with the common and his own belief (9) a) that veins, just as arteries, carried nutriment to all parts of the body and b) that veins supplied the kidneys with material to be excreted.[5] He did not become aware of these contradictions, otherwise he would have dwelt on them and perhaps discovered the function of the veins and, subsequently, also the principle of the greater circulation.

This conception was not reached by Cesalpino, although he himself introduced the term "circulation" in the matter of blood movement. All this seems contradictory today but was not so in the 16th century, as it would not have been in preceding times. (Let us recall that Galen did not conceive of the lesser circulation, although he maintained that with each systole blood was thrown from the right ventricle into the pulmonary artery from where it could not return but had to move forward.)

Cesalpino used the term circulation around 1570, in his *Questiones Peripateticae*, in connection with the lesser circulation only,[6] while the

[5] "Vena autem cava ramos in totum corpus dispergit, ut simul cum arteriis universas partes nutriant. Ab eadem cava rami quidam insignes ad renes tendunt, venae emulgentes vocatae, per quas superflua aquolitas excernitur, ut per vasa urinaria in vesicam feratur, unde urina redditur." (*Speculum Artis Medicae Hippocraticum* Liber VII, cap. I, Partium naturalium apparatus, pp. 488/489).

[6] I have taken the following quotation from the second edition (1593): "Huic sanguinis circulationi ex dextro cordis ventriculo per pulmones in sinistrum eiusdem ventriculum optime respondent ea quae ex dissectione apparent. Nam duo sunt vasa in dextrum

claim to the discovery of the greater circulation is based by some on the *Questiones Peripateticae*, by others on *De Plantis* or on the *Questiones Medicae*. Obviously, Cesalpino employed the term circulation long before there was any thought of the movement of blood in a closed circuit. It was a loose, unprecise use of the word, just as is done today when we speak of the lesser, of the greater, of the coronary, or of the portal circulation, none of which is more than a segment of the circuit.

In the *Questiones Peripateticae*, the author dealt also with the blood flow in extrathoracic parts of the body as it occurs under physiological conditions. In this connection he spoke of the arterio-venous links through which the arteries received what they needed from the veins, the alimentum auctivum, while in turn the veins got what they needed from the arteries, namely, the alimentum nutritivum or calor nativus or spiritus flammae [7] (Quest. IV). This continuous movement is not identical with that through the intrapulmonary anastomoses, where blood is moving, nor does it correspond to our present conception of the blood flow. There is no indication that the anastomoses serve as the outlet for arterial blood that reached the periphery. In the anastomoses alimenta and spirits move to and fro, blood, however, passes under unphysiological conditions only, for instance, when a vein has been opened.

To my knowledge, in Cesalpino's books there is only one passage which refers to something that is carried back by the veins to the heart after it had been received from the arteries. This passage is to be found in *Questiones Medicae*, Liber Secundus, Quest. XVII, under the title " Suffocationem in angina fieri magis oppletis venis jugularibus quam clauso laryngis osculo." In his attempt to explain phenomena elicited in the veins through obstruction, for instance, by bandaging the upper arm, Cesalpino mentions Aristotle's *De Somno*, where the differences between day and night were described with respect to the blood flow, the transport of native heat and of spirits, the pulse qualities and the behavior of veins and arteries. Twice in this passage Cesalpino states that the native heat, having been carried in the *arteries* to the brain in *day* time, *during sleep*

ventriculum desinentia, duo etiam in sinistrum: Duorum autem unum intromittit tantum, alterum educit, membranis eo ingenio constitutis. . . . ***partim per medium septum*** (underscored by me; this is a regress as compared with Servetus, Colombo and others). partim per medios pulmones refrigerationis gratia ex dextro in sinistrum transmittitur." (Lib. V., Quest. III., p. 125 E and p. 126 A.)

[7] " Motus igitur continuus a corde in omnes corporis partes agitur, quia continua est spiritus generatio, qui sua amplificatione diffundi celerrime in omnes partes aptus est, simul autem alimentum nutritivum fert, et auctivum ex venis elicit per osculorum communionem, quam Graeci Anastomosim vocant " (Liber V, Quest. IV, p. 123 B).

returns by way of the veins to the heart. " Transit enim in somno calor nativus ex arteriis in venas per osculorum communionem quam Anastomosin vocant, et inde ad cor " (p. 234 C).

This sentence is correctly translated by Willis (7) and by Foster (8). In Arcieri's book there appears a sentence identical with the one quoted here, except for the words " in somno " which are missing. If these words were omitted, this would be a misrepresentation apt to give undue credit to Cesalpino. If, however, Cesalpino somewhere dropped the difference between day and night, then we would have to believe that he advanced another step towards the present conception.

I consulted on this matter Dalton (10), Sprengel (11), Tollin (12), Willis, Foster, Luciani (13), Wyatt (14), and Castiglioni (15). In none of these books is there any evidence that Cesalpino took this step and delegated to the capillaries the function of channeling the return of the arterial blood via veins to the heart.

Because Cesalpino did not ask himself from where the veins get *the amount* of blood required for an uninterrupted centripetal movement he did not arrive at the conception of systemic circulation and in his posthumous work he characterized the blood flow as irrigation.

In the irrigation scheme there is a pool, a pump, a series of distributive vessels and the terrain to be irrigated. Irrigation is a one-way scheme. There are no special channels through which the fluid, after its dispersal in the irrigated area, is going to be collected and returned to the pool in order to be used again and again for irrigation. Had Cesalpino envisaged this return and thought of it, thus completely parting from Galen who also had used this simile without thinking of the arterial blood's return via the veins to the heart, this step would have been Cesalpino's greatest scientific achievement. He would have given it some space in his writings, whether or not he had realized its full significance and whether or not he could provide experimental evidence. As a matter of fact, he who was a prolific writer devoted not a single line to the problem of a continuous return of blood from the arteries via veins to the right heart, while he extensively dealt with the transport of blood from the veins via heart to the arteries. Do not Cesalpino's partisans put into his words what was not in his mind?

Cesalpino detached himself from Galen more than any of his contemporaries, but he did not have the imagination a) to part from the Aristotelian idea of a difference between day and night in the direction of the flow of the " heat," b) to extend the idea of the heat's return to that of blood, and c) to combine his and his predecessors' observations

into a completely new synthesis, to the flow of blood in a closed circuit. Nor did Cesalpino or anybody else in the 16th century use the fifth way, that of quantitative reasoning, in order to arrive at the conception of a closed circuit.

Before Cesalpino, nobody had much reason for becoming curious as to the quantity of blood poured from the veins through the heart into the arteries. As long as the movement in the veins was of a to and fro character and a part of the fluid contents of the veins was filtered out through the urinary passages, the gains in the arterial blood volume could be assumed to be small and well matched by the amount of fluids filtrated out of the arteries by the kidneys, the sudoriferous glands and the lungs. This was in keeping with common sense and with the experience regarding the influence of fluid intake upon urination and perspiration. With Cesalpino's discovery of the real direction of the venous blood flow, the balancing factors changed entirely. Had Cesalpino become aware of this change, he would probably have realized the quantitative discrepancy between the influx of blood into the aorta and the amount of fluid filtrated out of the arteries. Thus, the necessity of other constantly and differently working outlets in the arterial system would have become obvious and the revelation of a flow in a circuit might have followed. But, in his books there is no sign of such a train of thought.

At Cesalpino's time and before, quantitative reasoning was applied to some static values and helped in the solution of some partial problems. Thus, presenting the conception of the pulmonary circulation, Servetus pointed to the discrepancy between the caliber of the pulmonary artery and that of a vessel the sole purpose of which would be supplying the lungs with blood. Another example regards Vesalius and Cesalpino as well. They came to discard the central position of the liver in the production and transportation of blood, by measuring the change in the lumen of the vena cava on its way from the liver to the heart. Regardless of whether Cesalpino's hydrodynamics were correct, by this reasoning he took a large step away from Galen, but instead of courageously traveling further towards the conception of a circuit encompassing both the lesser and the systemic part of the circulation, he stopped halfway and, just as Vesalius, turned to Aristotle. This, and not, as Garrison believes (16), the lack of convincing experiments, explains why Cesalpino's deviations from Galen failed to stir up a revolution in the medical world. By giving preference to Aristotle over Galen and by correcting this and that detail he did not shake the foundations of tradition. The first who did this was Harvey.

How did Harvey arrive at his theory and how did he prove it? By original and ingenuously devised experiments, by substituting observation and experimentation for "speculation"?

Harvey developed the conception of the circuit, *first*, by logically exposing inconsistencies in the opinions on the heart's anatomy and function, on the purpose of the lungs and the pulse, on the size and task of the pulmonary vessels, on the content of the arteries and the blood flow, on their intake of air and elimination of vapors, etc.; and *second*, by pondering on the quantum and the source of the blood moved from the veins to the arteries (17).

The first point filled the lengthy "Introduction" which took up about 17 per cent of the whole book. In reality, this is not an introduction but part one of a book that consists of four divisions. In the second part, that is from the first chapter through the seventh, Harvey's anatomical and embryological studies on the transfer of blood from the veins to the arteries and on the role of the heartbeat were expounded. As will be substantiated later, up to the end of chapter 7, Harvey's conclusions regarding the blood flow have not reached far beyond Colombo and Cesalpino. The theory of circulation and the proof of it were placed in the eighth and ninth chapters which together with the tenth to fourteenth chapters form the book's third division. In the remaining three chapters, that is, in the fourth part, Harvey discussed the application of the new theory in physiology, pathology and therapy, described the difference between the blood in the gastric, hemorrhoidal, splenic and portal veins, and made excursions into the anatomy and physiology of the embryo, into comparative anatomy, especially into the structure and function of various parts of the heart with remarks about Aristotle, Hippocrates, Galen, and so on.

It will not be necessary to return to the first or to the last part of the book.

In chapter 8 of *De Motu Cordis*, we read: "For a long time I turned over in my mind such questions as how much blood is transmitted, and how short a time does its passage take. Not deeming it possible for the digested food mass to furnish such an abundance of blood without totally draining the veins or rupturing the arteries, unless it somehow got back to the veins from the arteries and returned to the right ventricle of the heart, I began to think there was a motion in a circle." This was so "strange and undreamed of" that from its publication he rightfully expected serious trouble for himself.

One may compare the quoted passage with anything Cesalpino wrote

about the movement of blood. As far as I could ascertain, in chapter 8 of *De Motu Cordis* it was for the *first* time that the theory and the method by which it had been derived, were put on paper. The theory was born by cogent reasoning, not by experimentation, and it was quantitative logic which in spite of faults in the knowledge of some essential details, in chapter 9 provided the irrefutable proof that there are *no alternatives* to the theory of a closed circuit.

It was a simplifying theory which resolved inconsistencies and perplexities of bygone days, a theory which needed no further proof, although corroborative evidence and complementary discoveries were still forthcoming for some time.

Harvey knew the total amount of blood in man and in various animals, but he did not know the stroke volume. This is not surprising, as even two and a half centuries later the opinions about the amount of blood propelled with each systole were wrong. Then, Volkmann and Vierordt generalized animal experiments, saying that the output per heartbeat was about 1/400 of the body's weight which for man implied an amount of 175 grams, that is more than twice the correct amount as shown later by gasometric observations.

Knowing neither the stroke volume nor the circulation time, Harvey proved the circulation in a way that resembles much less a laboratory experiment than the famous bargaining between Abraham and his Lord in order to save Sodom and Gomorrha. It is worthwhile to recall Harvey's proof.

Whether with each systole 1/3, 1/6 or 1/8th of the blood contained in the left ventricle entered the aorta, whether it was half an ounce, three drams or one dram, the blood volumina which after 30 minutes, that is after more than 1,000 to 4,000 heart beats, were thrown into the aorta, must add up to an amount larger than the total of the body's blood content.[8] Stability of action demanded that the left ventricle discharged per systole as much blood as it had received per diastole from the right heart. Whether in the 30 minutes in question, the blood that entered the pulmonary artery amounted to 83 lbs. 4 ozs., or to 41 lbs., or to but 10 lbs. 5 ozs., even the smallest of these quantities surpassed by far the amount of fluid the liver could possibly have received within the corresponding stretch of time from the food intake. Even if 10 lbs. 5 ozs. of blood would suffice for replenishing the right ventricle within 30 minutes, yes, within one hour or a whole day, the total intake by mouth

[8] Harvey considered regurgitation of blood into the left ventricle an impossible thought. In this connection he referred to the authority of Galen (Chapter 7 of *De Motu*).

within this same time would be insufficient. The day would have to end with a deficit of blood required for replenishing the right heart. The latter would have to fill with nothing and would have nothing to discharge into the pulmonary artery. The work would have to be interrupted. But the heart pumps continuously up to death, day and night. Therefore, the blood which the right heart receives daily cannot depend on the daily intake by mouth; it must come from sources other than food transformed ad hoc in the liver. Nor can this blood be supplied from unused reserves hidden somewhere, as there are no such blood-reserves. Therefore, the blood which pours into the right heart with each diastole must be the same which some time before had left the aorta and from the arteries re-entered the veins to be carried back to the heart. The disproportion between the total amount of blood in the body—a few quarts—and the amount of blood moved by the heart within each day, exceeding by far the weight of the whole body, is, according to Harvey, of such a magnitude—at least 500 lbs.[9]—that nothing *except* the endless and relentless movement in a closed circuit accounts for it.

This quantitative reasoning reported in chapter 9 of *De Motu Cordis*, and not his experiments, placed Harvey among the leading figures in the history of medicine.

To prove the circulation, Harvey did not inject anything into blood-vessels to observe when and where it will reappear, although the technic of such a procedure had been developed by Sylvius. In his book, Harvey did not prove the smaller circulation and the direction of the blood flow in the pulmonary vessels by ligating them, as was done later by J. Pecquet (1651). Nor did Harvey show the transit of blood from the arterioli to the veins; the first who saw this was Malpighi. By ligating a snake's vein below the heart and by compressing the aorta above it (see chapter 10), Harvey did not learn or teach more than was already known about the transfer of blood from the cava to the aorta. It was a beautiful demonstration, but in view of what was known previous to him, it was inconsequential regarding the theory of circulation.

With elegance and sharp logic did Harvey demonstrate features of the blood flow in the arm (chapter 11). By tightening or lessening a ligature, as was done for a thousand years before him, he now prevented the influx of blood into, and its evacuation from, the arm, then permitted the first and impeded or prevented the second, or permitted both. By these manipulations he altered volume, color and temperature of the arm below the ligature, the strength of arterial pulsation[10] in this area, the effectiveness

[9] The real value is many times higher.

[10] Mentioned also in Chapter 3.

of phlebotomy, and thus demonstrated and explained 1) that blood did not enter the limb through the veins; this had already been discovered by Cesalpino; 2) that in the limb blood was transferred from the arteries to the veins, which was a postulate of the new theory; 3) that in the arm venous blood was not to re-enter the arteries and 4) that the blood-vessels in the arm were filled by virtue of the heart's propulsive action and not by suction of a vacuum. The latter item was also a matter of inquiry with regard to the heart itself (chapter 4). Since auricular blood continued gushing into the dying ventricle after the latter's apex had been cut off, Harvey denied suction of the dilating ventricle to be a force behind the intracardial blood movement. He failed to realize the inconclusiveness of an experiment which by the very fact of opening the ventricle robbed the latter of the vis vacui.

The contents of chapter 11 were supposed to prove the "second proposition," namely, that blood was steadily being forced by the pulse into every part of the body in a much greater amount than is needed for nutrition or than the whole mass of blood can supply. Harvey did not know how much is needed for nutrition, nor did he understand the relationship between the moving blood and the nutrition of the tissues any better than did his predecessors except for the single item that the veins did not serve this purpose (see Curtis (18)). He demonstrated that in a limb verifiable observations and logical interpretation were in agreement with his theory. But, there was no experimental evidence as to the transfer of arterial blood into the veins of the abdomen, neck and head. Bacon might have considered a generalization from the arm experiments as unwarranted, and the method not a "true induction" (19). One had to be convinced of Harvey's reasoning and theory in order to see in his arm experiments more than they showed. His theory was not a generalization derived from experiments on the blood flow in the arteries or veins of the arm.[11] On the contrary, these experiments were exemplifying a posteriori the theory derived by quantitative reasoning in chapter 9. Chapters 12 and 13 did not enlarge the terrain beyond that covered in chapter 11. In chapter 12, only one additional observation was reported, namely, the diminished effectiveness of a venepuncture in a fainting individual; without sufficient blood entering the brachial artery, the blood supply of the cubital vein is insufficient for a venepuncture, as was already explained

[11] Such a generalization would have met with Bacon's remark sub § 19 of book 1 of *Novum Organum* as "the way now in use": "The one hurries on rapidly from the senses and particulars to the most general axioms, and from them, as principles and their supposed indisputable truth, derives and discovers the intermediate axioms."

under other circumstances at a previous occasion (chapter 11). In chapter 13, the discussion centered around the function of the venous valves. By experiments with a probe on an opened vein as well as by clinical demonstrations for which pictures were used partly identical with those published by Fabricius, the latter's interpretation of the purpose of the valves was corrected and an understanding was reached of the mechanism behind the exclusively centripetal flow in the veins. Reviewing chapters 11-13 as well as the short chapter 14 which is but a restatement of the theory of circulation, one realizes how much attention Harvey paid to the venous blood movement. This occasionally led to the contention that Harvey's theory had its roots in his absorption with the anatomy and " non-quantitative " physiology of the vein valves. A note by Boyle (see Bayon (20)) gave support to this view.

Harvey died in 1657 and Boyle's note on the only " discourse with him " was written in 1688, i. e. over 30 years later. One should not see in such a remark more than is obvious, that is, an indication of the first link of a chain of scientific endeavors in the course of which the theory was developed. Harvey's interest in the veins stemmed from the time of his association with the rediscoverer of the valves, Fabricius of Aquapendente, who imparted his curiosity as to their purpose to his pupils, while his interest in the heart and in the lesser circulation probably came later. Harvey's conclusion based on the study of vein valves did not and could not go beyond that of Cesalpino and Fra P. Sarpi. There was only one reason why in resolving the confusion regarding the blood flow Harvey was more successful; namely, at one time or another he had the idea of applying quantitative reasoning to the dynamics of blood movements. Without this guiding idea, Harvey would have approached his own arm observations with no more lucidity than did Cesalpino and, just as the latter, would have had to stop short of the goal.

I am aware of the discrepancy between my view and the consensus of opinion. It did not escape my attention that in Chapter 1, under the title " The Author's Reasons for Writing," Harvey's own words apparently speak against my contention. This they do on superficial reading only. According to the first chapter of *De Motu*, the book was written to make known his " very frequent experimentation " on a variety of animals in order to learn the motions of heart and arteries. As may be recalled, in chapters 8-14 in which the theory of circulation is dealt with, not much is to be found of animal experimentation. Chapter 1, I believe, is only the introduction to chapters 2-7, the contents of which, important as they may be, have but little to do with the theory of circulation. To show that this

is no exaggeration, it will be useful to review as shortly as possible work, method and results published in chapters 2-7.

In the second chapter, the movements are described of the heart in situ after the removal of the chest wall and the pericardium. The heartbeat is found to be a part of the systole. During the contraction, the ventricle gets hard and pale, lifts itself and strikes the thorax; it thickens in its walls, becomes smaller in volume and empties itself expelling blood into the arteries. During the diastole, the ventricle is soft, exhausted and passive. The heart acts during systole.

In the third chapter, pulsation of the arteries is related to the heartbeat. By forcing blood into the arteries, the ventricle distends them and causes pulsation. The pulse, the arterial diastole, is due to the impulse of blood. In all superficial as well as deep *arteries* the pulse is synchronous[12] with the ventricular systole, with which it corresponds in time, frequency, rhythm, volume and regularity. When the ventricle stops beating, arterial pulsation ceases. The changing vigor of the outflowing blood stream of a punctured artery depends on the ventricle's alternating states of activity and passivity.

In the fourth chapter, the time relation between auricular and ventricular action is analyzed. Against Bauhin's and Riolan's assertion the two auricles contract simultaneously, followed by synchronous systole of the two ventricles. Observations of the time interval are easier in cold-blooded and bloodless animals because of their slow heartbeat which at times may even stop without ensuing death. The dying heart goes through four subsequent steps; first the left ventricle stops and is followed by the death of the left auricle; the right ventricle is next, while the right auricle, as was observed by Galen, is the last to stop. After a ventricle has ceased beating, a finger placed upon it may feel, and the eye may see, as I have already mentioned, the impact of incoming blood. A pigeon's ventricle that has stopped beating can be revived by placing on it a finger moistened with warm saliva. In animals without lungs and with one ventricle only, the auricle contracts before the ventricle. In eels, each isolated fragment of the heart cut into pieces, contracts and relaxes alternately. Finally, the order is described in the development of the parts of the heart and of their motions in a chicken embryo, confirming some of Aristotle's observations.

In the fifth chapter, it is stated "on the basis of the structure of the heart and the position and action of the valves" that with each contraction a part of the blood is transferred from the veins to the heart and from

[12] Harvey's simile: blowing into a glove distends *all* fingers at once.

there over the arteries to the extremities of the body. No observations of any kind are presented in this chapter. Instead, Harvey engages in a discussion with Galen, playing him out against Erasistratus and vice versa.

In the sixth chapter, Harvey demonstrates the passage of blood from the main vein to the main artery in fishes, toads, frogs, serpents and lizards, all of which have only one atrium and one ventricle without septum in between. The blood is pushed forward by consecutive contractions of the atrium and the ventricle. Again the relationship between the heart's systole and the spurt of blood through a punctured artery is shown. As to animals having lungs, instead of attempting to demonstrate the lesser circulation, Harvey refers to the anatomy of dead fetuses. " . . . There is reason to believe that in the embryo blood is continually propelled" through the foramen ovale and the ductus arteriosus to the left heart and aorta wherefrom it cannot regurgitate because of the membrane covering the foramen ovale from the left side and of the valves at the root of the arteria pulmonalis. The opinion that the two open passages and the blood passing through them have the task of serving the lungs, is rejected as inconsistent with the fact that these passages are obliterated after birth, that is just when the lungs, becoming active, need more blood than before. It is, therefore, reasonable to conclude that in the embryo these passages serve some other purpose, and that after birth nature opens other passages. " Why may we not conclude that this passage is made through the substance of the lungs in warm-blooded animals . . ? " No observations or experiments on this point are reported here or in the next chapter.

In chapter 7 Harvey again deals with the lesser circulation. First he argues per analogiam. Why should blood fail to filter through the loose substance of the lungs, if sweat filters through the skin, water through the earth, urine through the much denser kidneys, and all alimentary juices through the liver? The respiratory movements must, as Galen observed, open and close porosities of the lungs just as in a sponge. Then Galen is extensively quoted and Colombo mentioned in connection with the pulmonary vessels, the position of the valves and the propelling function of the chest. Finally Harvey states that, as blood constantly pours into the right heart and is constantly drawn from the lungs into the left heart, blood must constantly pass from the vena cava into the aorta through the tiny pores and vascular openings in the lungs; to force the blood through these pores, the right ventricle had to be created. Animals without lungs do not need nor have a right ventricle.

This short review of the first seven chapters bears out the following conclusions: 1) Harvey carried out a large number of vivisections and

dissections as well as observations on early stages of hatched eggs; 2) As a rule, the course of the phenomena to be observed, was not altered, but watched in normal sequence under natural conditions; only occasionally an artificial experimental situation was created and the normal course of events distorted (arteriopuncture, cutting off the ventricular apex, etc.); 3) Harvey failed to prove experimentally the pulmonary circulation but considered it a necessity by purely logical reasoning; 4) in the first 7 chapters the transfer of blood from the arteries into the veins in the periphery is not mentioned at all; 5) Regardless of whether Harvey's experiments and observations were original or replicas of the work of others, in chapters 1-7 no new fact was brought into being which would have forced the new theory of circulation upon the mind of any anatomist. Whether the blood fills the ventricles by suction or propulsion or by both, whether the heart beats in systole or diastole, whether life starts and ends in the right auricle or elsewhere, whether there is complete synchronicity in the beat of the auricles and ventricles, respectively, whether or not Harvey understood the pulse better than his predecessors, whether or not he erred in the time analysis of the pulse, all these are items of relevance to the historian of cardiology, but they were immaterial for the conception of the theory of circulation. The same or similar observations and experiments made by the original designers, like V. Coiter, Cesalpino, Fabricius had not yielded more than isolated unrelated findings and led, if at all, to fragmentary interpretations and not to an all embracing concept on blood flow. It was Harvey's quantitative reasoning which brought observations and experiments under one hat and produced a new theory.

Following the publication of his book, in the course of discussions on his theory, Harvey carried out additional experiments, of which one may be cited because, had it not been forgotten, it would have prevented H. Sahli, a prominent European clinician in the 1910's and early 1920's, from pronouncing a new "theory of circulation." By ligating the aorta close to the semilunar valves and completely emptying the arteries of a living animal, Harvey proved what he had stated in *De Motu*, namely, that venous blood cannot reverse its course and return to the peripheral arteries (letter to Slegel, written in 1651 (21)). From this experiment Harvey wrongly concluded that the passage of blood between arteries and veins is not accomplished by capillaries, and that arteries end in the walls of small veins just as the ureters in the wall of the urinary bladder. This conclusion exemplifies the rule that it is dangerous to extract from an experiment more than is obvious. In direct contradiction to Harvey's conclusion, it is the capillaries which, as I have shown by means of oscil-

lomanometry (22), prevent both the reflux of venous blood to the arteries and an undue increase of the diastolic pressure.

In stressing as Harvey's outstanding merit his " countless vivisections and ingenious experiments " (Luciani), or his " rare skill in experimental demonstration " (Castiglioni), or his experimental achievements (Arcieri), one demotes Harvey's position in the development of medical science. Also Ryle is wrong in stating that " Harvey was the founder of the experimental method " (23). Harvey did not initiate experimental medicine or physiology. The centuries preceding him were not bare of experimentation in anatomy and physiology. Medicine was not more revolutionized by Harvey's experiments than it was by those of Leonardo da Vinci or Colombo. The revolution was accomplished by the introduction of quantitative reasoning in the study of a basic problem that was utterly confused in spite of observation and experimentation.

Prior to Harvey, new findings based on observation and/or experiment entered into the tangle of old opinions, semitruths and superstitions and, thus, actually helped in the preservation of tradition and confusion. An example of this was shown above in discussing Cesalpino's contribution. Harvey's method was different. First, by studying the logical structure of the dominant opinions he showed their inconsistency and defined the problem in such a way that eo ipso the method suitable for solving it was determined. Utilizing the quantitative approach by means of simple arithmetic and of the casus hypotheticus irrealis, he proved the absurdity of conventional views regarding the core of the problem and undermined the whole structure. In his rough estimates of biometrical phenomena Harvey made great allowances and did not care to measure, so to say, in decimal points where such an accuracy was meaningless and impossible. He understood how to disregard small and inessential items. Then, per exclusionem, he developed a new concept aiming at the solution of the comprehensive problem. Following this he tried to gather supporting evidence, observational and experimental, regarding *some* items only, leaving to the future all matters either at the moment experimentally insoluble or of no immediate relevance to the support of the new theory.

Experimentation as a means of verifying and of elaboration is known to be of the greatest value; it may also, by detecting inconsistencies, lead the theoretician to new tracks. However, just as most of today's statistical work in medicine, so also experimentation may go on for a long time without any new idea. No amount of clinical or experimental or statistical observations automatically leads by the sheer weight of the accumulated data to a new guiding concept, where one is due. On the other hand,

without intimate knowledge of the field, as it can be obtained only by thorough clinical or anatomical and physiological work, respectively, it is hard to properly pose a problem and to develop promising new ideas. Still harder is it, without this intimate knowledge to meet the opposition of the experts. Thus, continuous experimentation and observation as reported in Chapters 2-7 of *De Motu*, were of assistance to Harvey, although they themselves did not lead to the new theory. The fact of frequent experimentation and the overevaluation of the experiment per se, helped to distort Harvey's position in medical history. He was first of all a thinker and fine observer; as an original experimenter he does not rate high.

Arcieri is right in pointing to sentences and passages in *De Motu Cordis* which sound similar to quotations from Cesalpino whose name is not mentioned. This is still far from plagiarism. Both men dealt with the same subject, both were familiar with certain facts, both utilized these very facts for their respective conception of the blood movement, Cesalpino remaining in the old maze, though closer to the exit than any one before, while Harvey, using observations and ideas of others and of his own, arrived at a *new* theory. The theory of a closed circuit is Harvey's, just as Kepler's three laws are of Keplerian origin, althought the observations on which they were based had been made and collected by Tycho. The law of gravitation is Newton's although he integrated in it observations and laws of others including Kepler. The theory of relativity is Einstein's although the observational and experimental evidence was and still is delivered by others.

Just as in physics and chemistry so also in medicine at certain stages of development, logical quantitative reasoning is the primary tool and experimentation the lesser one, while at other stages the reverse is true. Epochs end and start with new ideas, conceived either by mathematical deductions as in Harvey's case, or by chance observations, or by the development of entirely new tools of research, while the epochs themselves are filled with slowly accumulating and systematic observations and experiments. The history of medicine is replete with examples where bold imagination, straight logic or simple quantitative reasoning decided matters against misleading and confusing experimental evidence or against tradition. As instances may be quoted Virchow's (24) studies on embolism and pyemia as well as on lung abscesses in puerperal fever, and Semmelweis' (25) solution of the pathogenesis and prevention of puerperal fever.

In these and in other instances, quantitative reasoning, too often looked down upon, has helped to elucidate or to solve a basic problem. Correctly

applied, as was done by Harvey, this method may bring progress in leaps and bounds, while experimentation, if not guided by new correct hypotheses, logically conceived or hit upon by lucky chance, brings progress at a slow pace or leads to dead ends.

Without focusing attention on the quantitative aspect of Harvey's work, the genesis of the theory of circulation will remain a riddle and in the theory's assessment historians will waver, just as in the past, between calumniation and idolization, missing the core of the issue. This applies also to W. Pagel's (26) attempt at linking the theory with Harvey's Aristotelian philosophical background. Harvey, according to this, believed in the excellence of the circular motion and in parallelism between macro- and microcosmal phenomena. From the macrocosmal pattern of circulation and rhythm he supposedly deduced the blood flow in a circuit and rhythmic regeneration of the blood in the heart.

Pagel's approach would be illuminating, had Harvey turned out a hypothesis per analogiam.[18] But, Harvey's was not a hypothesis; it was a theory with no possibility of an alternative, resting, as it did, on three undemolishable equations:

(1) in general	$b_t = b_s \cdot n_t$	b_t being the mass of blood propelled by the left ventricle during the time t, b_s being the corresponding mass during one systole, and n_t the number of systoles during the time t.
(2) for any 30 minutes	$b_t > I_d$	I_d being the total intake of food and fluid during any day, that is 24 hours.
(3) for any day	$b_t >> B_b + I_d$	B_b being the total blood content of the body.

On account of the factor n_t there could be no doubt in the validity of the second and third equations, and Harvey's theory was the only possible solution.

The Aristotelian background is not what divided Harvey from his predecessors. The breach probably was due to the progress physics underwent in the short interval between the time in which Vesalius, Cesalpino and Fabricius were in a perceptive age and the time in which Harvey was creative. This progress influenced medicine in several directions. For instance, while formerly, in spite of some attempts at counting (Herophilus, Cusanus), analysis of the pulse was qualitative with only a vague

[18] A deduction per analogiam from macrocosmal phenomena to physiology would have been even less stringent than extension per analogiam to man of results obtained in animal experimentation. Such an extension is sometimes justified and helpful, but whether or not it is in the respective case, is always to be learned later by direct observation.

connotation as to its frequency, now, under the influence of Galileo and Kepler, there was added the exact time factor. (Kepler advised to count the pulse by the minute). The spirit of measuring, weighing and counting now slowly permeated medicine, routine as well as research. One of the first who grasped the potentialities of a mathematical approach was Harvey. Physiology was not the only field which was enriched. Within a few decades after Harvey, quantitative reasoning led to the creation of a new branch of medical science, to bio-statistics, and its first representative, Graunt, succeeded in deriving laws regarding the occurrence of births and deaths in man.

Summary

1. Harvey is not the father of experimental physiology, nor the discoverer of the blood circulation by way of experimentation. His discovery was made by logical reasoning about the enormous discrepancy between the known blood content of the body and the estimated amount of blood daily propelled by the heart. Harvey was a master of observation and of simplification of problems. Just as Galileo before him in physics and Lavoisier later in chemistry, so in medicine Harvey brought about a revolution by centering research on a basic problem answerable by simple quantitative deduction. He supported reasoning by some illustrative experiments, yet experimental evidence for his theory came later and was provided by others.

2. At the start of this study I was inclined to believe that the pro-Cesalpino historians were right. I had to revise this opinion. In principle, it is of minor importance whether Cesalpino or Harvey was first to conceive of the greater circulation. For those who identify history with registration of data, with rectification of errors and with doing justice to persons who by mistake or malice were denied due recognition, it may be stated that, in spite of some indications, so far, there is no evidence for Cesalpino's right to priority; he did not imagine the greater circulation, nor did he put it on paper.

3. Cesalpino had a much wider range of scientific interests and more knowledge, but in the development of medicine he is one of those who brilliantly end an epoch, while Harvey is one of the few who initiate an era.

4. Harvey modernized physiology by solving a complicated problem, proving that it can have no solution other than the proposed one, regardless of whether or not full experimental evidence can be provided. Harvey's

work shows that to achieve great scientific progress one has not only to realize the existence of a problem but has to formulate it in such a way that the most suitable method of research is eo ipso given. In his case this method was quantitative reasoning based on observations and utilization of experiments on man and animals as ancillary tools.

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ODYSSEY OF AN AMERICAN CANCER SPECIALIST OF A HUNDRED YEARS AGO

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Present day realization that cancer is the deadly enemy of all living creatures has caused thinking people everywhere to form a common front against it. Surgeons in operating rooms, scientists in laboratories, explorers seeking curative plants in tropical jungles, contributors to "Mr. Blanding's Dream House" and the Damon Runyon Fund, these and countless thousands are working to one end—the discovery of the causes of cancer and the means of preventing and eradicating it. Yet, over a hundred years ago, an American doctor thought that he had solved the cancer problem and so well did he press his claims that famous doctors abroad attended his clinics and were so much impressed with his work that he was asked to demonstrate his technique in a great London hospital. The only traces of his work to be found to-day are hidden in the dusty archives of medical libraries or in long forgotten medical journals; but, in his heyday, he had originated a new surgical technique in his field, was the author of a much discussed book on cancer,[1] and the first foreigner ever to be permitted to practice in a London hospital,[2] and this by invitation of the Board of Governors of the hospital. That American cancer specialist was Dr. Jesse Weldon Fell.

My personal interest in Dr. Fell springs from an almost forgotten incident of my childhood. I was helping my mother plant portulacas and she told me that the first ones she had ever seen grew in her grandmother's garden at the family homestead near New Hampton, in northwest Jersey, and that the seed had been brought to her grandmother by the famous Dr. Jesse Fell who had picked it on the Battlefield of Waterloo. When I asked her why Dr. Fell was famous and what he was doing at Waterloo, she replied that he was a well known cancer specialist of London and that as a young man he had lived near her grandfather's house and been friendly with the family so that, in after years, when he revisited his native land, he called on them to renew old acquaintance. She also said that he was reported to have treated a member of the royal family but this I have been unable to verify although the rest of her story has proved to have

[1] J(esse) Weldon Fell, *A Treatise on Cancer and Its Treatment*, xii, 95 pp., London, J. Churchill, 1857.

[2] Sarah M. Fell, *Genealogy of the Fell Family in America*, Philadelphia, A. H. Sickler, 1891, p. 208.

been based on fact. Her grandmother planted the portulaca seeds and saved others as they ripened and, as long as she lived, her garden was bright with portulacas.

Mother's story slipped from my mind but, years later, while engaged in research on an old Jersey murder case, I found a Jesse Fell named among the witnesses and I remembered the portulaca incident. I questioned a ninety-four year old relative and learned that "Jess," the witness, and Dr. Jesse Fell were one and the same man. Later, a western relative sent me some old books which had been in my great grandfather's family and among them was one inscribed with the name "Jesse Fell" and the date, 1842. This series of coincidences so intrigued me that I set out to find what I could about this man whose name kept bobbing up into my life. I had made some progress on the American part of his story when material came to hand which substantiated my mother's story for the most part and gave valuable information on Dr. Fell's life and travels abroad. This information was found in a letter which Fell had written to an old college chum in America.[3] In commenting on the letter, its editors said, "Concerning Jesse Weldon Fell it has been possible to learn precious little."[4] I read the letter and it occurred to me that since I knew so much of Dr. Fell's personal life and was studying his professional career, others might be interested in my findings. The war and the bombing of London made research necessarily slow but now I feel that enough loose ends have been picked up to enable me to tell the story. But first I must warn you that *my* Dr. Fell is not the "I do not like you, Dr. Fell" of the old verse. That misliked gentleman, Dr. John Fell, one-time Bishop of Oxford, was just a very, very distant relative of our subject.

It was difficult to trace the paternal background of Jesse Weldon Fell because so many men of his family had the same name and it took much time and patience to disassociate his record from those of other Jesse Fells who were notables in their way. The Fells[5] were vigorous in thought and action and the pioneering spirit seems to have been strong in many of them. They were of English origin, their six hundred years old manor house "Longlands," in Cumberland, remaining in the family ownership down to our own times. The first Fell[6] to emigrate to America came in 1705 and settled in Bucks County, Pennsylvania. He later returned to England where he died in 1748, leaving behind him a numerous progeny

[3] M. F. Ashley Montagu and W. J. Musick, "A Yankee Doctor in England in 1859," *Bulletin of the History of Medicine*, vol. XIII, 1943, pp. 217-228. (Will be quoted as: Fell, *Letter*.)

[4] *Ibid.*, p. 217. [5] Sarah M. Fell, *op. cit.*, p. 14. [6] *Ibid.*, p. 26.

in America. There his son Joseph became the father of the Jesse Fell (Judge Fell) after whom our doctor and other Jesses were to be named. The Fells were Quakers and the widow[7] of one of the name became the wife of George Fox, founder of the Society of Friends. Although many of the American members of the Fell family left the Quaker faith and joined other religious bodies, Dr. Fell's grandfather was always a faithful adherent of the Society of Friends.

"Judge" Jesse Fell,[8] as he was commonly known, was born at Buckingham, Pennsylvania in 1751. He married Hannah Welding and it was by changing the spelling of her maiden name that her grandson received his middle name of Weldon. Judge Fell was the proprietor of an inn at Wilkes-Barre which was run in accordance with strict Quaker principles and was such a notable success that it is still remembered by the people of that city. Entering politics, he was twice elected Sheriff of Lucerne County[9] and later served as Associate Judge of that County for over thirty years. Although he was a successful farmer and the first President of the Lucerne County Agricultural Association,[10] it is not on his excellence as a tavern keeper nor on his political, judicial, and farming careers that his fame rests. He was the inventor of a grate which would burn hard coal[11] and it was, in part,[12] due to his invention that the anthracite beds of Lucerne County became valuable, and modern industry possible!

Judge Fell conceived the idea that hard coal would burn in a grate if a natural draft could be sent through a fire on which a sufficient amount of coal had been placed in the proper position.[13] He made his first grate of green hickory wood[14] and, when convinced that he was on the right track, collaborated with a nephew in fashioning one of iron. He invited his neighbors in to see its first trial but, to his chagrin, only two appeared. The others thought that the judge must have taken leave of his senses in believing that coal would burn in a grate, or that he was making them subjects of a practical joke. For the two who came, however, seeing was believing and news of the Judge's invention spread like wildfire. Every

[7] Margaret Fell of Swarthmore Hall, Cumberland, England.
[8] S. M. Fell, *Genealogy*, p. 50.
[9] *Ibid.*, p. 51.
[10] *Ibid.*
[11] "The 'Invention' of Anthracite Coal," (i. e. the use of hard coal in connection with a natural draft), *Heating and Ventilating Magazine*, vol. I, December, 1904, pp. 209-211.
[12] Oliver Evans is credited with having anticipated Fell's invention in 1803, but the Judge did not know this fact in 1808.
[13] *Heat. and Vent. Magazine*, p. 209.
[14] *Ibid.*, p. 210.

family wanted a coal burning grate; for all time anthracite coal had come into its own. Fifty years later, some townsmen of Wilkes-Barre gathered at the old Fell Inn to commemorate the anniversary of his invention by burning some anthracite coal in his first grate.[15] Evidently the Fell atmosphere acted as an incentive to further achievement for out of this anniversary meeting grew the Wyoming Valley Historical and Geological Society.[16]

A second Jesse Fell (Jesse W.)[17] merits our attention because he influenced the course of American history at a critical point in our national destiny. He was born in 1808, the year of the Judge's invention. His father, after whom he was named, was a hatter but the son determined to become a lawyer and worked for his board in order to secure the necessary schooling. His education finished, he walked from Pennsylvania through Ohio into Illinois, selling books to pay his way. He opened a law office at Vandalia, Illinois, and lived in the same boarding house as Abraham Lincoln, whose close associate he became.[18] Tiring of law, he sold his practice to David Davis,[19] entered the real estate business and became the founder of several towns. When a depression bankrupted him, he worked to pay his creditors in full and, turning to farming, he became interested in forestry. He pioneered in the planting of trees,[20] an enterprise for which the state has been profoundly grateful. He served as trustee for Ohio Wesleyan and was largely instrumental in securing the establishment of the first state supported institution in Illinois, the Normal School. But his services to the nation far outweigh his service to his adopted state. He was the first person to suggest to Abraham Lincoln that he should become an active candidate for the presidency;[21] and *it was at his request, and for his use that Lincoln penned his famous autobiography!*

Fell was a Whig and after the Lincoln-Douglas debates, he visited the eastern and middle states and learned at first hand the favorable reaction of those sections to Lincoln's part in the debates.[22] Returning home, he

[15] V. L. Maxwell, Lecture (2nd), "Mineral Coal," read at Institute Hall, Wilkes-Barre, Penna., Feb., 1858. Wyoming Historical and Geological Society, *Proceedings and Collections*, 4th ed., 1883, pp. 30-32.

[16] Hon. E. L. Davis (founder), Address, Feb. 10, 1883, *ibid.*, p. 43.

[17] Robert Dale Richardson, *Abraham Lincoln's Autobiography*, Beacon Press, Boston, Second edition, Preface.

[18] Frances I. Milton Morehouse, "Life of Jesse W. Fell," *University of Illinois Studies in the Social Sciences*, vol. V, June, 1916, p. 19.

[19] *Ibid.*, p. 27.

[20] *Ibid.*, p. 106.

[21] R. D. Richardson, *op. cit.*, p. viii.

[22] *Ibid.*, p. 4.

told Lincoln that he had become a formidable candidate for the presidency,[23] and advised him to write an account of his early life for circulation in western Pennsylvania.[24] Believing that he had absolutely no chance of winning the nomination, Lincoln refused,[25] but later relented and wrote the autobiography [26] which every schoolboy is familiar with. This he gave to Fell who forwarded it to Pennsylvania where it was published in the form of a news letter in the *Chester County Times* of February 11, 1860. The influence of the autobiography has been tremendous. In 1860, it answered the question "Who is Lincoln?" and put the common people of the country [27] squarely behind Lincoln's candidacy. Since that time it has been the corner stone of Lincoln biographical literature.[28] An interesting fact about the sponsor of the letter, Jesse W. Fell, is that, although he was a Whig of prominence and a party leader, he refused public office for himself.[29]

But it is high time that we turn our attention to the immediate family of Dr. Jesse Weldon Fell. His father, Dr. Samuel Fell,[30] son of the coal burning judge, was born at Wilkes-Barre in 1788. He graduated in medicine in 1808 and began practicing in Sussex County, N. J. Later, he located at New Hampton, Warren County, where he married Lydia, daughter of the Major Henry Dusenberry [31] who had been one of Washington's aides at the Battle of Monmouth. Fell was considered a good doctor and won considerable reputation as a surgeon.[32] His confreres called him a "doctors' doctor" because of a successful operation for strangulated hernia which he performed on Dr. E. Everett of Sussex.[33] Two facts indicate that he was not a practicing Quaker. He served as captain of a Warren County company of volunteers known as The Washington Greens [34] in the War of 1812, and he was very fond of fox hunting. This last fact may have resulted in his death for he is reported

[23] *Ibid.*, p. 5.
[24] *Ibid.*, p. viii.
[25] *Ibid.*, p. 7.
[26] *Ibid.*
[27] *Ibid.*, p. xiv.
[28] *Ibid.*, note 1, p. 17.
[29] S. M. Fell, *Genealogy*, p. 140.
[30] John Blane, *Medical History of Hunterdon (N. J.) County*, Newark, Jennings & Hardham, 1872, p. 235.
[31] S. M. Fell, *op. cit.*, p. 93.
[32] James P. Snell, *History of Warren and Sussex Counties*, Philadelphia, Everts & Peck, 1881, p. 511.
[33] *Ibid.*
[34] The author's great grandfather was first lieutenant in this company.

to have died as the result of a fall from his horse while following the hounds.[35] He was practicing at Belvidere, New Jersey, at the time of his death and died at the age of thirty-six, leaving a widow and three children. The youngest child, a boy of six, was Jesse Weldon Fell, the subject of our study.

Jesse Weldon Fell[36] was born at Belvidere on September 30, 1819. He received his early education from the famous teacher, the Rev. John Vanderveer, and later studied under the Rev. John McNair. In 1839, he married Catherine Menagh Dunn and settled with her in Port Colden, Warren County,[37] where he clerked in a relative's store. Jesse probably inherited his energy and initiative from both sides of his family for his Dusenberry relative was truly a man of action, although, unlike the Fells, his dream proved to be without substance. When he learned that the Morris and Essex Canal would run through his part of northwest Jersey, William Dusenberry[38] thought that he knew the spot where a thriving metropolis would spring up at the western end of the canal. There he built a store, a church, and other buildings to house the expansion he envisioned, but luck passed him by and Washington, N. J., became the thriving town he had thought his settlement would become. With the usual sardonic country wit, his neighbors labeled his village " Dusenberry's Folly." To counteract their ridicule, he named the place Port Colden in honor of Governor Cadwallader Colden of New York, and the hamlet is still known by that name. It was in William's Port Colden store that Jesse clerked.

But Jesse was too much of a Fell to be satisfied to end his days as clerk in a country store and he determined to follow in his father's footsteps. He was twenty-two when he moved his growing family to the Dusenberry homestead at New Hampton and began the study of medicine with the resident physician, Dr. Robert McClenahan.[39] In the autumn of that same year, 1842, he located his family at 155 Spring Street, New York City, and enrolled in the Medical School of the University of New York from which he was graduated two years later. He began his practice in New York City and was one of the founders of the New York Academy of Medicine when it was organized in 1847, three years after his graduation from medical school. His association with the Academy, however, was not to prove a happy one and his experiences with some of its members may account for his decision later to locate permanently in London. A

[35] J. P. Snell, *op. cit.*, p. 511.
[36] S. M. Fell, *op. cit.*, p. 207.
[37] *Ibid.*, p. 207.
[38] Snell, *op. cit.*, p. 714.
[39] S. M. Fell, *op. cit.*, p. 207.

study of The Academy records[40] does not clear up the matter at issue between Dr. Fell and the dissenting members of the Academy but the bare facts seem to have been as follows.

On January 13, 1847, Jesse W. Fell signed the roll of founders[41] and at the meeting of the Academy held on February 24th, he was appointed temporary librarian in the absence of Dr. Thomas W. Markoe.[42] On July 5, 1848, he offered his resignation as a fellow of the Academy,[43] but, on motion, the resignation was laid on the table.[44] It was taken up at the stated meeting on August 2nd and, on motion, referred to the Committee on Medical Ethics.[45] Fell paid his last dues in 1854 and the word "suspended" appears after the record of payment in Dr. Purple's notes.[46] But the dispute was not ended, nor the matter clarified, and the case dragged on for several years longer.

Meanwhile, Dr. Fell was passing through harrowing personal experiences. His wife died of consumption in 1853 and, of the four children born to the couple, only one, Jessie Helen, a child of seven, survived.[47] These troubles, coupled with his inability to compose his differences with the Academy may have led him to consider removing his practice elsewhere for it was at this time that he made a complete break with his old life. In May, 1855, he married Elizabeth Ayrault Smith,[48] a lady of Quaker extraction from Middletown, Connecticut. In that same month of May, accompanied by his wife and Jessie Helen, he sailed on a wedding trip which had as its main objective a visit to the Paris Exposition[49] of Napoleon III but which was, in fact, to end his professional life in the United States.

But the month before he sailed, Dr. Fell again tried to have his resignation accepted by the Academy. His new letter of resignation was dated April 4, 1855.[50] The letter was referred to Dr. Pond, Academy Treasurer, who on August 1st, made a specific report on the subject.[51] On September 5th, the resignation was taken from the table and the matter again referred back to the Committee on Ethics,[52] and when that

[40] New York Academy of Medicine List of Founders with Biographical Notes, compiled by Dr. Samuel Smith Purple. Undated manuscript.
[41] *Ibid.*
[42] *Ibid.*
[43] *Ibid.*
[44] *Ibid.*
[45] *Ibid.*
[46] *Ibid.*
[47] S. M. Fell, *Genealogy*, p. 207.
[48] *Ibid.*
[49] *Ibid.*, p. 208.
[50] New York Academy of Medicine, Minutes of Meetings, 1855, 1856. Manuscript from safe.
[51] *Ibid.*
[52] *Ibid.*

body reported back on January 2, 1856, we finally get a clue to the matter at issue. The Committee made a "Special report in relation to the resignation of Dr. Fell, recommending that the Academy refuse him honorable dismission in consequence of his alleged relationship with a certain notorious quack."[53] Evidently Fell had defenders present for the minutes continue, "A discussion thereupon ensued in which several members took part." On motion of Dr. Detmold, the resignation was again referred to the Committee on Ethics with instructions to take testimony and report back to the Academy as to what steps it were necessary to take in regard to it. But, on September 3rd, Dr. Warren, representing the Committee, made only an oral report as "the Committee was not yet prepared to make a final report." No further report has been found: whether the resignation was finally accepted, or whether "honorable dismission" was denied is not known. But when we consider that Dr. Fell first tried to resign in 1848, and that his resignation was still hanging fire eight years later, it seems reasonable to conclude that he must have had some very able defenders as well as some pretty determined opponents. It seems that he had become associated with a Dr. Gilbert in devising a new method of treating cancer. Evidently, the New York doctors were of two minds—those willing to give the new method a hearing and those just as determined to oppose the innovation. While the controversy still raged, he was putting the ocean between himself and his detractors.

His party sailed on the good ship Atlantic and, landing at Liverpool, they proceeded to London where Fell proved to be an indefatigable sightseer but was disappointed with his first view of the Thames, "a dirty little stream about the size of the Lehigh at Easton."[54] The Exposition was next visited ("dear Paris"), then Holland, Waterloo (where he picked my great grandmother's portulaca seeds), Prussia, Germany and the Rhine, and other points of interest.[55] Fell had found much to admire in England and he decided to take up the practice of medicine there. He was happy in England for he wrote later, "Although I am a thorough American and think there is nothing in all creation to compare with 'my own, my native land,' I should leave England with regret."[56] Finances were no part of his problem.[57] He resided at 70 Warwick Place, Belgrave

[53] *Ibid.*

[54] Fell, *Letter* (see above note 3), p. 218.

[55] *Ibid.*, p. 227.

[56] *Ibid.*

[57] "He attained an eminent degree of private practice—we need hardly say, that all practice in London, which is eminent, is also invariably highly lucrative." *British Medical Journal*, May 16, 1857, p. 416.

Square, N. W., near Buckingham Palace. Queen Victoria and other members of the royal family passed his establishment frequently but he was not impressed by her majesty. " She is a little, *plain* (*homely American*) red faced woman, looks as though she was fond of ' Beer & wine' &c—Prince Albert is a fine looking man—the children only so, so."[58] Other ruling monarchs he saw he thought a homely lot but he made a gallant exception in the case of the French Empress (Eugenia). " She is very pretty and looks more queenly than any."[59] His establishment was quite pretentious. He kept a carriage and coachman, a riding horse, two female servants, and a page at his London place[60] and, in the summer of 1858, occupied the house formerly " used by the Ex Queen of France, and where the duchess of Orleans died last may."[61] The palace was a " splendid one, and magnificently furnished . . . it had 27 Beds in it—a splendid Library & fine paintings—the lawn and grounds delightful, running down to the river."[62] But the upkeep was high. " I paid $100 a week rent, and then we were obliged to keep 5 female servants, 2 Gardeners, coachman & footman—besides keeping up my establishment in London."[63] American visitors to London looked him up; Jenny Lind called on his family;[64] Barnum dined with him;[65] his daughter had a governess in the house and had been at school in Paris.[66]

After settling in his London offices, Dr. Fell began to use[67] his orignal method of treating cancer. He did not publicize this fact at first as London friends had warned him that his being a foreigner and a stranger would mitigate against his securing the endorsement of the medical profession until the value of his method had been proved by positive cures.[68] He also feared that unskilled hands might attempt to use his method without understanding its complexities, or might apply it in cases where no relief was possible, or under circumstances which might cause it to fall into disrepute,[69] results which he was unwilling to risk. Then again he felt that he was entitled to reap any financial benefits or any fame arising from its use, for, as he said, " The originator of a new remedy is often lost sight of when some leader in his profession adopts his method."[70]

According to Dr. Fell, medical men of a hundred years ago were divided into two schools of thought as to the origin of cancer. One group thought

[58] Fell, *Letter*, p. 222.
[59] *Ibid.*
[60] *Ibid.*, p. 223.
[61] *Ibid.*, p. 224.
[62] *Ibid.*
[63] *Ibid.*, pp. 225 f.
[64] *Ibid.*, p. 224.
[65] *Ibid.*, p. 227.
[66] *Ibid.*, p. 228.
[67] J(esse) Weldon Fell, *Treatise on Cancer and Its Treatment*, p. b.
[68] *Ibid.*, p. b.
[69] *Ibid.*
[70] *Ibid.*, p. vi.

that cancerous growths were purely constitutional while the other held that they were entirely local in nature.[71] Dr. Fell thought that there was something to be said for both theories and that, while the original cancer generally began as a local growth, in time the patient's constitution became secondarily contaminated.[72] While searching for a cure for both conditions, he became convinced that the remedy lay in the discovery of a curative plant rather than in the knife,[73] and that persons living closest to nature would prove the best source of information as to such plants. Pursuing investigation along these lines, he learned of a root which the Indians living on the shores of Lake Superior used for healing purposes[74] and, after considerable experimentation with this root, he finally originated a medicinal paste in which it was the chief ingredient. The Indians called the root "puccoon" but botanists call it the *Sanguinaria canadensis* because it exudes a copious stream of blood-like fluid when broken. It had long been recognized as a powerful emmenagogue and alterative and, as such, had been admitted into the Pharmacopoeia of the United States.[75] Dr. Fell first used the puccoon in a pure state on ulcerated surfaces but later combined it with other substances in order to hasten its action.[76] In time, he found that chloride of zinc was the best medium for his purpose[77] and the compound made with it he used to such effect that, "Large ulcerated tumors were removed in the space of a few weeks and with little or no pain to the patient."[78] He next extended the treatment to non-ulcerated surfaces successfully, as he claimed,[79] and eventually perfected his compound which became known to the medical profession under the name of "Fell's Paste."

To apply the paste, shallow incisions were made about one-half inch apart in the eschar, great care being taken to avoid living tissues.[80] Paste was then spread on cotton strips and daily applied to the incisions.[81] "This treatment was continued for a period of from two to four weeks when the disease was destroyed and the cancerous matter fell out, leaving a flat, healthy sore which generally healed with great rapidity."[82] In addition to the external treatment thus used, Dr. Fell paid much attention to the general health[83] of his patients, ordering nourishing and sustaining food for them and administering the puccoon internally in small and repeated doses.[84] Where possible, he had his patients circulate freely out of doors,

[71] *Ibid.*, p. B.
[72] *Ibid.*
[73] *Ibid.*, p. 56.
[74] *Ibid.*, p. 56.
[75] *Ibid.*, p. 57.
[76] *Ibid.*, p. 58.
[77] *Ibid.*
[78] *Ibid.*
[79] *Ibid.*, p. 59.
[80] *Ibid.*
[81] *Ibid.*, p. 60.
[82] *Ibid.*
[83] *Ibid.*, p. 61.
[84] *Ibid.*

not only because he felt that the fresh air would benefit them physically, but also because the knowledge that their condition did not necessitate their being kept in bed served to keep up their morale and became a real factor in their recovery.

Dr. Fell devised a unique method of interesting London physicians in his compound and technique of treatment.[85] For over a year and a half after beginning his practice at 70 Warwick Square, he opened his consulting rooms to the members of his profession for the purpose of demonstrating his treatment to them. He says, " Over a hundred doctors, and some of them the most justly celebrated in the country visited my rooms and nearly all of them have spoken of my treatment in the highest terms and treated me with the greatest politeness and liberality." [86] One visitor,[87] however, incurred his displeasure for " He visited me for six months and saw the treatment in every stage of application and later wrote an article published in the *Lancet* of 1857 without even mentioning my name or his visits to my rooms." [88] Some other visitors also proved ungrateful for " They carried off some of my remedies but this dishonest act availed them nothing as even hospital analysis failed to detect the vegetable potion in them." [89] But some of Dr. Fell's visitors were impressed with his work and, in 1856, the Board of Governors of Middlesex Hospital invited him to demonstrate his method in a series of experiments in the cancer wards of that great institution. To understand the importance of this invitation, it is necessary for us to know something about Middlesex Hospital and the conditions set up in the deed of gift for controlling the practices of its cancer ward. One of these conditions was to make considerable trouble for our American doctor, Jesse Weldon Fell.

Middlesex Hospital was founded in 1745 and, in 1791, one Samuel Whitbread donated the sum of £3,500 [90] " for the relief of persons afflicted with cancer, and the investigation of a complaint which, though extremely common, is both in regard to its natural history and cure, but imperfectly known." [91] Two requirements were set up as condition of the gift: the name of every patient treated was to be kept, and unusual cases were to be made a matter of special record, *and these records were always to be*

[85] *Ibid.*, p. vi.
[86] *Ibid.*
[87] Edward S. Haviland, " On the Use of Chloride of Zinc in the Treatment of Cancer," *Lancet*, vol. I, Feb. 14, 1857, pp. 161-162.
[88] *Ibid.*, p. vii.
[89] *Ibid.*
[90] *Lancet*, vol. II, October 24, 1857, p. 426.
[91] The author regrets not to be able to find the source to which she owes this quotation.

open to the public.[92] Later, other endowments were made and, in time, the cancer ward became a sort of experimental school as the Controlling Board made it available for the trying out of such new methods of treatment as were considered safe and proper to try.[93] The Board laid down two requirements which practitioners desiring to experiment in the ward had to meet: the proposed method of treatment must be explained to the surgical staff of the hospital before its trial could be permitted, and the demonstrator must consent to have his method made public within a reasonable time. Applications for permission to demonstrate, made from time to time by various doctors, were frequently rejected by the Controlling Board, which fact makes Dr. Fell's case the more remarkable. He did not ask for permission to demonstrate; the Board of Governors asked him to make a trial of his method at Middlesex Hospital.[94] He is reputed to have been the first foreigner ever to be permitted to practice in a London hospital![95]

In view of what was to come later from the same source, it is interesting to read an announcement published in the *Lancet* of the time. "We understand that Dr. Fell, the American physician whose treatment of this disease has of late been so much spoken of in London, has made an arrangement with the authorities of Middlesex Hospital, by which he has taken charge of a certain number of cases in the Cancer wards of that establishment, for the purpose of subjecting them to the action of his remedies. Dr. Fell has communicated, in confidence, the particulars of his treatment to the surgical staff, who will watch the cases and report on the results. *This experiment reflects great credit on the medical officers of the Middlesex Hospital.*"[96] Before consenting to the demonstrations, Dr. Fell imposed certain conditions to which the hospital authorities agreed.[97]

1. He (in confidence)[98] was to tell the hospital surgeons the nature of the remedies to be employed, their mode of preparation, and the manner of their use.

[92] "Middlesex Hospital Report on Cancer" (from the *Spectator*), *Living Age*, January, 1858, pp. 30-31.
[93] *Ibid.*
[94] Fell, *Treatise*, p. vii.
[95] S. M. Fell, *Genealogy*, p. 208.
[96] *Lancet*, vol. I, January 31, 1857, p. 128 (Italics are not in the text).
[97] Fell, *Treatise*, p. ix.
[98] "Secret Surgery, and the 'Mystery Men' of the Middlesex." *Lancet*, vol. I, April 4, 1857, p. 358. This editorial constitutes a reversal of the previous position.

2. Twenty-five cases were to be subjected to treatment for a period of eight months.

3. He pledged himself to publish the full particulars of his system of treatment *within a period of six months from the conclusion of the experiments*; in case he failed to do so, the duty of publication was to devolve on the Middlesex Surgeons.[99]

On January 22, 1857, the series of treatments began. During its course, Dr. Fell had entire charge of three wards and cared for an average of sixty patients.[100] He also had the pleasure of ordering " one of the self conceited would-be great men of the London profession out of my wards and made him go, to." [101] (A *Lancet* representative met with refusal when he attempted to see some of Fell's patients).[102] While experimenting, Fell was working on his report and this, the *Treatise on Cancer and Its Treatment*, was published June 1, 1857, six months after the beginning of the experiments instead of six months after their conclusion. The book was dedicated to the Middlesex Surgeons " as a slight acknowledgment of their uniform kindness and valuable assistance during my connection with them." [103] In it, cancer methods in general were discussed and the origin and particulars of his own method disclosed. Of the latter, he wrote, " This plan succeeded admirably and is believed to be entirely original." A preliminary report on the results of the experiments had been made by the Surgical Staff at Fell's request for inclusion in his book and this was dated March 18th, less than two months after the first experiment was begun. While stating that the limited period of the trial made positive conclusions impossible, it found that there were certain points on which the Fell treatments showed distinct advantages over prevalent surgical methods. These gains, summarized, were as follows: [104]

1. The treatment was in accord with known principles of surgery; was safe, ingenious, and easy to apply.

2. It could be employed in cases, both surgical and non-surgical.

3. Patients were not confined to bed or house and their health manifestly improved over those of ordinary cases by reason of exercise in the open air.

4. Exhaustion and hemorrhages arising from cutting operations of cancer were absent, and the patient less prone to constitutional affections such as erysipelas and pyaemia.

[99] Fell, *Treatise*, p. ix.
[100] Fell, *Letter*, p. 224.
[101] *Ibid.*
[102] *Lancet*, vol. I, Mar. 28, 1857, p. 318.
[103] *Ibid.*, p. b.
[104] Fell, *Treatise*, p. ix.

5. Enucleation of the diseased mass was succeeded by a healthy and cicatrized surface.

6. Treatment was less painful than usual under caustics; pains, when felt, were not in the tumor itself but in distant parts of the body.

"The undersigned have not as yet had time to ascertain the average duration of the benefits conferred by the treatment, nor have they any means of knowing whether, in the event of the return of the disease, there be any difference observable from what is known to take place after incision.

Signed
Alexander Shaw
Campbell De Morgan
Charles S. Morse
Mitchell Henry"

Fell closed his treatise by stating that, "Results show that out of every ten cases treated with puccoon, only three of the number returned for further treatments while the statistics of those operated on (according to the tables generally adopted by writers on the subject) show that from eight to eight and a fraction out of every ten cases return within two years. The first person suffering from cancer and treated with puccoon of whom I have any knowledge is still living in the enjoyment of good health although the disease was removed fifteen years ago." [105]

With the possible exception of the Middlesex Hospital authorities, there evidently were not many members of the British medical profession who received Fell's work with kindly feelings for its author. While the reviews in the *British Medical Journal* [106] failed to take the matter seriously, the *Lancet*, which had directed a running fire of criticism against Fell and the Middlesex surgeons during the entire course of the trials, now outdid all previous efforts in holding them up to ridicule and censure. It spoke of "the magic influence of mystery—the omne ignotum pro magnifico," called Fell the "great 'mystery or medicine man' of the West," and said that, "Knowledge of Dr. Fell's secret has been dearly purchased by the sacrifice of the fair name of one of the London hospitals." [107] It was in the face of such criticisms that Dr. Fell completed his experiments and the Middlesex Surgical Staff made ready its final report on his work for the hospital authorities. The report was dated October 18, 1857, and was

[105] *Ibid.*, p. 63.
[106] Issues of June 27, 1857, p. 555, and October 24, p. 422.
[107] *Lancet*, vol. I, June 13, 1857, p. 606.

subsequently published by the order of the Quarterly Court.[108, 109] That public interest in the Fell experiments was continuing is shown by an article from the *Spectator*, published in the *Living Age* of the following January[110] which commented upon the Surgeon's Report, gave excerpts from it and, in conclusion, stated that, " The considered opinion of the Middlesex surgeons was that *the incisions constituted the chief value of Fell's work*. The use of zinc in cancer treatment was not new to them; the bloodroot seemed to have no effect when used internally and its external effect seemed limited to removing odors; but for the purpose of destroying cancer, it was inert."[111]

That Dr. Fell smarted under the criticisms his work met with at the hands of his British brethren is shown in his letter, written on March 13, 1859, five months after the Middlesex Surgeons' *Report* appeared. In it he wrote, " I can assure you that the *great Medical men* of London, look a mighty lot larger, and greater, when looked at across the Atlantic—they are rather small affairs, and as a whole they are the greatest set of Quacks, I have ever seen, I have many warm friends among them and of course I do not express myself here in the same way."[112] After enumerating their alleged faults and downright dishonesties, he closed the subject by saying, " I know of but two men whom I would trust to treat me if I was ill."[113]

In 1860, another Middlesex surgeon reported further on the results of the Fell experiments. " Amongst many patients, treated . . . in . . . 1857, there was a marked difference in the effects. In some it appeared

[108] *Report of the Surgical Staff of the Middlesex Hospital, to the Weekly Board and Governors, upon the Treatment of Cancerous Diseases in the Hospital on the Plan Introduced by Dr. Fell.* London, J. Churchill, 1857.

[109] " We never read a bad Report so well worth reading . . . as a scientific report, or a literary composition, it is almost beneath criticism." *Lancet*, vol. II, October 24, 1857, p. 424.

[110] *Living Age*, 2nd series, vol. XX, January, 1858, pp. 30-31.

[111] *Ibid.*, p. 31. For a fuller account of Fell's plan, the reader is referred to the original *Report of the Surgical Staff* (see note 108) or to the excerpts reprinted in the *Living Age*. The specific approval of the surgeons for the use of graduated incisions was given in the following statement. " We are of the opinion that this is its only, but its very great value. (They) constitute a new feature in the treatment of cancerous tumors for which we find no parallel in the writings of the past or in the practice of present surgeons . . . but the advantage placed in the hands of surgeons by the invention of gradual incisions, claims henceforth their very frequent adoption in the treatment of cancerous tumors, as well as a grateful acknowledgment of the ingenuity of their inventor " (*Report*, p. 50, reprinted verbatim in the *Living Age*, p. 31).

[112] Fell, *Letter*, p. 223.

[113] *Ibid.*, p. 224.

to act in the same manner as erysipelas and hospital gangrene. Apparently, but in fact incompletely, removed, the disease reappeared in a few weeks; in those cases, however, in which caustics were carried through the cancer into healthy tissues, no such recurrence took place before the healing of the wound. After that event, the cases treated by caustic followed the ordinary course of cancer. Disease reappeared, and death ensued as usual." [114]

Little is known of Dr. Fell's later years. His daughter was with him in London in 1859 [115] but, as she was married to Frederick Dellicker,[116] an American, in New York City in 1862, it is probable that she returned to the United States with her father and his wife some time between those two dates. The *London and Provincial Medical Directory* listed Dr. Fell as practicing at the Warwick Place address in 1861, but the entry also stated that the listing was made without his knowledge,[117] a fact which strengthens my belief that he was in the United States at that time. He probably gave up his Warwick Square offices before returning to the United States, but whether he remained in this country or returned to England during the Civil War period, I have been unable to learn. But, by 1871, he was back in London and was located at Campbell House, Tollington Park, Holloway. N.,[118] where he continued the practice of medicine until 1889.[119] Somewhere along the line he became a member of the British Medical Association [120] which fact shows that he was still held in repute professionally. The files of the New York Academy of Medicine record him as having died in 1890 but the London Medical Directories of 1890 and 1891 do not mention his name in the obituary notices. His wife died in 1888 [121] and it is possible that he may have returned to his native land after her death and died here. If he died in 1890, he was seventy-one years old and had survived the failure of his Middlesex Hospital experiments by a period of thirty-one years.

[114] C. H. Moore in: *A System of Surgery, Theoretical and Practical, in Treatises by Various Authors.* Edited by T. Holmes. Vol. I, General Pathology, London, Parker and Son, 1860, pp. 565 f. and 567 where Dr. Fell's method is described.

[115] Fell, *Letter*, p. 228.

[116] S. M. Fell, *Genealogy*, p. 383.

[117] I owe this information to the kindness of the Librarian of the Royal Society of Medicine.

[118] *The Medical Directory for 1871 and General Medical Register.* London, Churchill.

[119] S. M. Fell, *Genealogy*, p. 208.

[120] *Medical Directory*, 1885.

[121] S. M. Fell, *op. cit.*, p. 208.

Acknowledgment

The author wishes to express her indebtedness to Dr. Howard Reid Craig, Director of the New York Academy of Medicine, who granted her permission to use material from the Academy Archives for the purposes of this study; to Dr. M. F. Ashley Montagu, of the Hahnemann Medical College Staff, Philadelphia, who allowed excerpts from "A Yankee Doctor in England in 1859" to be included; and to Mr. G. F. Home, Librarian of the Royal Society of Medicine, London, who furnished certain definite information without which the completion of this work would not have been possible. For the cooperation and kindly interest shown by these gentlemen, she is most grateful.

TEXTS AND DOCUMENTS

TWO NINETEENTH-CENTURY ITALIAN MEDALS FIGURING SURGICAL INSTRUMENTS

LUIGI BELLONI

The medical coins and medals known to collectors number several thousand. The two largest collections, viz., that of Giuseppe Brettauer (1835-1905), Trieste oculist,[1] and that of Horatio Robinson Storer (1830-1922), Boston gynecologist,[2] contain some 5500 and 4000 items respectively.

Yet, in spite of these large numbers, coins and medals representing *isolated* surgical instruments are comparatively rare. From amongst the best-known one may recall: 1) the cupping glass in Greek coins, resembling in shape the representations of Telesphoros, a son of Asclepius (Bernhard);[3] 2) the "salasso," or set of instruments for phlebotomy, in the medieval coins of Faenza, which was the emblem of the Manfredi, the masters of the town (Castiglioni);[4] 3) the vaccination lancet, usually accompanied by the corresponding vaccine tube, in the vaccination medals of the early nineteenth century, especially French ones (Pfeiffer & Ruland).[5]

An attempt is made here to illustrate, by setting them against the background of their history, two medals figuring *isolated* surgical instruments. Though they refer to two different fields of surgery, they share the characteristic of having both been executed by Milanese engravers at an interval of less than thirty years.

* * * *

[1] Holzmair, Eduard—*Katalog der Sammlung Dr. Josef Brettauer "Medicina in nummis."* Wien 1937.

[2] Storer, Horatio Robinson—*Medicina in nummis. A Descriptive List of the Coins—Medals—Jetons relating to Medicine, Surgery, and the Allied Sciences, edited by Dr. Malcolm Storer.* Boston 1931.

[3] Bernhard, Oskar—*Griechische und römische Münzbilder in ihren Beziehungen zur Geschichte der Medizin.* Zürich-Leipzig-Berlin 1926.

[4] Castiglioni, Arturo—Il salasso nell'arma gentilizia dei Manfredi, signori di Faenza. *Essays on the History of Medicine Presented to Karl Sudhoff . . .*, London-Zürich 1924, p. 159-182; *Boll. Ist. Stor. Ital. Arte Sanit.*, 1925: 5, 82-89, 109-118. La nobiltà del salasso. *Il volto di Ippocrate*, Milano 1925, pp. 101-129.

[5] Pfeiffer, L. & Ruland C.—*Pestilentia in nummis. Geschichte der grossen Volkskrankheiten in numismatischen Documenten.* Tübingen 1882.

The first medal (fig. 1; Brettauer 230; Storer 667), the work of Luigi Cossa (1789-1867), commemorated the first operation of lithotripsy by percussion performed at Milan after Heurteloup's method.

Leaving aside the numerous precursors, it may be briefly recalled that lithotripsy became a widely used operation only in the first half of the nineteenth century, mainly owing to the work of a number of French surgeons: J. Z. Amussat (1796-1856); J. J. J. Leroy d'Etiolles (1798-1860); Jean Civiale (1792-1867), who was the first to carry out the operation on a living patient, on January 13, 1824; and Charles Louis Stanislas Heurteloup (1793-1864), the son of the Surgeon-General of Napoleon's armies, baron Nicolas Heurteloup (1750-1812).

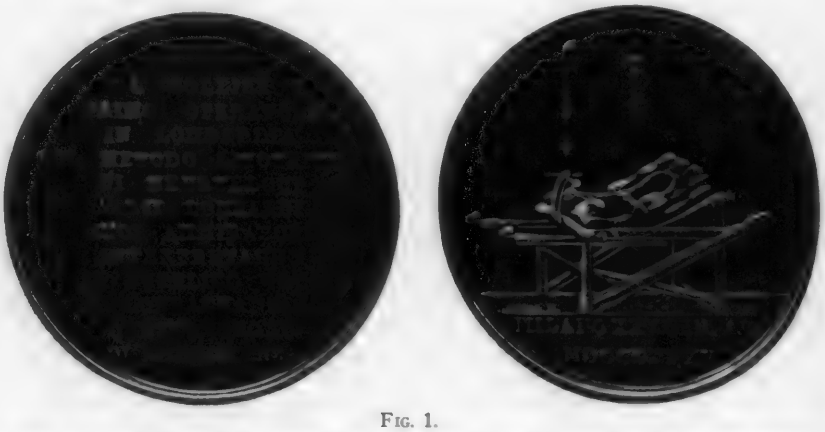

FIG. 1.

Bronze specimen (51 mm. in diameter) of the medal offered Carlo Colliex in commemoration of the first operation performed in Lombardy after Heurteloup's method of lithotrity.

In 1833, the "Académie des Sciences" of Paris awarded its "grand prix de chirurgie" to Ch. L. S. Heurteloup[6] for his discovery of the method of lithotripsy by percussion. It soon proved superior to the methods previously used, so much so that in 1859 it was considered the method of choice by Luigi Porta (1800-1875), Professor of Clinical Surgery in the University of Pavia, who wrote a monograph on lithotripsy very valuable also from a historical point of view.[7] In Italy, the first

[6] Heurteloup, Charles Louis Stanislas—*Mémoires sur la lithotripsie par percussion, et sur l'instrument appelé percuteur courbe à marteau, qui permet de mettre en usage ce nouveau système de pulvérisation des pierres vésicales; le tout appuyé de nombreux exemples de guérisons bien authentiques.* Paris, 1833. This will also be found on pages 163-278 of the same author's *De la lithotripsie sans fragments au moyen des deux procédés de l'extraction immédiate ou de la pulvérisation immédiate* . . . . Paris, 1846.

[7] Porta, Luigi—*Della litotrizia.* Milano 1859.

operation of lithotripsy after the "metodo urtelupiano" as it was called seems to have been performed at Bologna by Paolo Baroni (1799-1854), professor of theoretical surgery and obstetrics in that University,[8] soon to be followed by Alessandro Riberi (1794-1861), professor of operative medicine ("medicina operatoria") in the University of Turin,[9] and by his pupils Carlo Colliex[10] and Gaetano Pertusio.[11] Colliex, shortly after his return to Turin following two and a half years' stay in France, England, and Ireland during which time he had opportunities of observing the great masters of lithotripsy, gave a successful demonstration of intervention à la Heurteloup, completed in six consecutive sittings the first of which took place on September 2, 1834.

Reports of this operating success, thus publicly achieved in the presence of many leaders of the profession in Turin, soon spread to other Italian cities, and Colliex was invited to demonstrate the new method. Thus, January 1835 saw him at Milan[12] where he succeeded, at the hospital

[8] Baroni, Paolo—Operazione di litotrizia mediante schiacciamento col Percussore curvo di Heurteloup, eseguita in Bologna dal Prof. Paolo Baroni. *Bullettino delle Scienze Mediche* (Bologna), 1834: *10*, 105-107. Actually the operation was performed with a curved Heurteloup lithotrite modified by Charrière (i. e., of reduced size), and by using the screw device for crushing instead of the hammer.

Operazione di litotripsia col metodo dell'Heurteloup. eseguita in Roma con esito felicissimo dal cav. prof. Paolo Baroni. *Bull. Scienze Med.*, 1836: *1* (serie II), 372-375.

[9] Riberi, Alessandro—*Primi cenni su la litotrissia.* Torino 1834. *Nuove osservazioni su la litotrissia per percussione.* Torino 1835. Osservazioni di litotrissia, con alcune riflessioni sopra il medesimo argomento. *Giornale delle Scienze Fisico-Mediche*, maggio 1838. The above three papers are reproduced on pages 77-84, 85-98, 172-214 respectively of Vol. 1 of *Raccolta delle opere minori, con annotazioni e con la giunta d'argomenti inediti di Alessandro Riberi.* Torino 1851.

[10] Colliex, Carlo—Sulla Litotripsia; Memoria di Carlo Colliex, da Torino, dottore in Chirurgia; con istoria di un'operazione di questo genere dallo stesso felicemente eseguita. *Annali Universali di Medicina* (Milano), 1835: *73*, 5-58.

[11] Pertusio, Gaetano—*Lezioni pratiche sulla litotripsia per percussione.* Torino 1835. Summary in *Annali Universali di Medicina*, 1835: *75*, 153-168.

[12] Gippa, Luigi—Storia della prima operazione di litotripsia stata eseguita in Milano. *Annali Universali di Medicina*, 1835: *73*, 492-504.

Curti, Ambrogio—Di altre due operazioni di litotripsia, fatte in Milano dal sig. Dott. Colliex. *Annali Universali di Medicina*, 1835: *73*, 575-582.

The second case described by Curti (viz., the third case operated on by Colliex at Milan) ended fatally. The same may be said of the first case operated on by Colliex at Naples in January 1836 which he described in two reports entitled:

Operazione di litotripsia col metodo del barone Heurteloup, eseguita in Napoli dal dot. Colliex, descritta da questo medesimo chirurgo. *Il Filiatre-Sebezio* (Napoli), 1836: *11*, 81-83.

Continuazione della storia dell'operazione di liotripsia eseguita dal sig. Colliex. Autopsia del cadavere. *Il Filiatre-Sebezio*, 1836: *11*, 129-132.

Both at the operation and the autopsy of this case there was present Salvatore de Renzi (1800-1872), the famous historian of Italian medicine and—above all—of the School

of San Giovanni di Dio belonging to the religious order of the Fatebenefratelli, in relieving a 47 year old male patient of stone trouble in three sittings, the last of which took place on January 25, 1835. This public demonstration attended by the foremost surgeons of Lombardy—there were among them the already mentioned Porta and Carlo Cairoli (1776-1849), Professor of Institutions (i. e., theory) of Surgery in the University of Pavia [13]—met with so favourable a response as to lead to the founding, in Milan, of a "filantropica società." At its instigation, a commemorative medal was struck, of which the specimen in gold was presented to Colliex. This society also offered "two prizes of 1500 Milanese liras to be awarded one each to those two surgeons of the Lombard provinces who will be the first to perform, with prosperous result, extraction of calculus from the bladder in the living patient by Baron Heurteloup's method as already publicly used by Signor Colliex at the Pio Ospedale di San Giovanni di Dio in Milan." [14] One of these prizes went to Ambrogio De Marchi Gherini (1804-1889) [15] who in four sessions between April 18 and May 18, 1836 successfully freed of calculus a girl of seven at the Ospedale Maggiore of Milan. Gherini, then assistant, and later chief surgeon of that hospital, had only recently returned from a study tour abroad undertaken to perfect his knowledge and had stayed in Paris for four months in order to gain experience mainly in the art of lithotripsy.

The medal offered to Colliex (fig. 1) reproduces the instruments used

of Salerno. As editor of the periodical "*Il Filiatre-Sebezio*," De Renzi added to each of Colliex' notes favourable comments, and concluded by asserting that death was due to typhoid fever, a diagnosis which in fact contradicted the recorded findings of the autopsy.

Regarding an operation performed by Colliex at Mantua in 1835, cf.: Zarda, Francesco—Storia di litotripsia eseguita felicemente, ed ultimata, coll'ajuto di una nuova sciringa scaricatrice. *Annali Universali di Medicina*, 1836: *79*, 58-78.

[13] There were five sons (Benedetto, Ernesto, Luigi, Enrico e Giovanni) of Cairoli's marriage (1824) with Adelaide Bono (1806-1871), all of them heroes of the Italian Risorgimento. In the course of its campaigns the four younger brothers made the supreme sacrifice.

Enrico Cairoli (1840-1867) was at Garibaldi's side when he was wounded at Aspromonte (cf. comment on the medal in fig. 3). On September 4, 1862, Adelaide Bono Cairoli hurried to the wounded general's bed-side.

[14] Due premj di lir. 1500 di Milano da aggiudicarsi a ciascuno dei due Chirurgi delle province Lombarde che con felice esito eseguiranno i primi l'estrazione del calcolo della vescica orinaria nell'uomo vivente col metodo del barone Heurteloup già praticato pubblicamente dal sig. Colliex nel Pio Ospedale di S. Gio. di Dio in Milano. *Gazzetta Privilegiata di Milano*, 5 gennaio 1836.

[15] De Marchi Gherini, Ambrogio—Storia di una operazione di litotripsia col metodo del Barone Heurteloup. *Annali Universali di Medicina*, 1836: *80*, 119-129.

by him, i. e., the classical armamentarium of Heurteloup (fig. 2). From left to right, in the upper half of the free field may be distinguished a curved lithotrite (fig. 2/I), a hammer (fig. 2/II), and a metal catheter with faucet (fig. 2/III). In the lower half, the rectangular operating table is reproduced (fig. 2/IV), which permitted the "somersault ex-

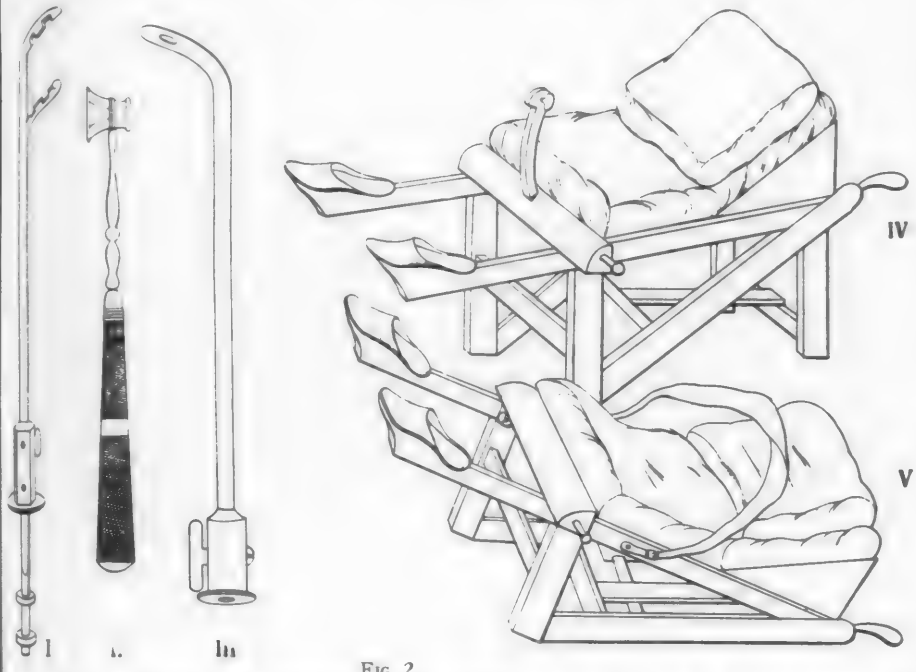

FIG. 2.

The basic instruments of Heurteloup's method, reproduced by the medal in fig. 1: I) curved lithotrite (with blades apart); II) hammer; III) metal catheter with faucet; IV and V) rectangular operating table in a horizontal (IV), and the so-called Trendelenburg (V) position. After Benvenuti, Adolfo, *Teorie e pratica della litotripsia*, Venezia, 1838.

pedient" ("culbute"): by folding up the two legs at the head-end of the operating table, the patient could suddenly be transferred into the so-called Trendelenburg position (fig. 2/V) so as to enable the calculus to be more readily grasped by the two blades of the curved lithotrite. The sling of the operating table served to prevent the patient from slipping back when the table was raised. From the corners of the foot-end of the table there projected "two adjustable arms, also of wood, and fitted with a Turkish

slipper each in which the patient places his feet during the operation." In the centre of the foot-end was planted a curved steel bar, the so-called "fixed point," with a slit, into which the frame of the lithotrite was screwed. Like this the female or passive blade was immobilized so as to obviate lesions of the bladder while the operator repeatedly struck the male or movable blade with the hammer, imparting it the pulverizing action as it moved along the fixed blade.

* * * *

The second medal (fig. 3; Br. 809, St. 2604), the work of Luigi Seregni (born in 1819), relates to the encounter at Aspromonte (August

FIG. 3.

Bronze specimen (60 mm. in diameter) of the medal offered by the Italian colony of Peru to Auguste Nélaton and Ferdinando Zannetti (mistakenly engraved as "Zanetti") in memory of their respective diagnostic and therapeutic achievements in the successful treatment of Garibaldi's wound.

29, 1862) in the course of which Giuseppe Garibaldi (1807-1882), who was marching on Rome at the head of his band of volunteers, was taken prisoner by Italian regular troops. At this distressing juncture, Garibaldi was hit by two bullets one of which caused a light superficial grazing wound in the outside upper third of the left thigh. The second projectile, or rather, bullet fragment, hit him, probably as a ricochet shot, on the medial side of the right ankle joint (fig. 4/I) and taking an oblique course outwards, downwards, and forwards, fractured the medial malleolus, opened the cavity of the joint lacerating the anterior part of the fibrous capsule, and finally was lodged in the depression defined by the astragalus, the heel-bone, and the cuboid bone (fig. 4/II).

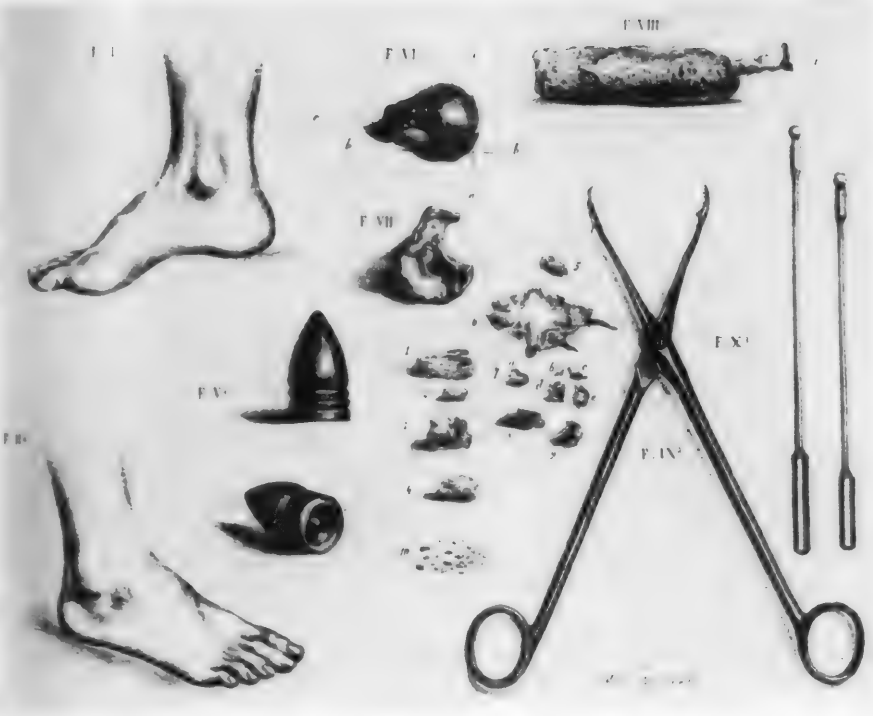

FIG. 4.

I) The site and shape of the wound on the medial side of the instep.

II) The incision effected by Albanese on the battle field in a vain attempt to extract the projectile. The incision corresponds in fact to the site in which the bullet came to be lodged after having penetrated through the joint.

V) Intact Bersaglieri (sharp shooter) bullet. (Instead of three, the bullet in the medal has only two circular grooves at its base).

VI and VII) Deformed bullet fragment extracted by Zannetti on November 23, 1862.

VIII) Prepared sponge which Basile, on the evening of November 22, introduced into the fistula and extracted on the following morning together with the bone splinter *x*.

IX) Toothed forceps employed by Zannetti in extracting the projectile.

X) Nélaton's probes.

1-10) Bone splinters, fragments of aponeurosis, and bits of cloth recovered from the fistula.

This plate is taken from Ripari's paper [16] with the omission, however, of his Figs. III and IV which show anatomical preparations of the foot dissected at the instep and serve better to explain the path taken by the bullet. Basile's work,[17] too, contains a plate almost identical with the present one.

On the field of battle, Garibaldi was given first aid by the surgeons of his ambulance, viz., Pietro Ripari (1802-1885),[16] Giuseppe Basile, and Enrico Albanese (1834-1889),[17] who all remained in regular attendance on the general until the wound was healed, and who also wrote detailed case histories. Their accounts and supporting documentary evidence have constituted the principal sources of information for the various medical historical studies of the incident. The most exhaustive and most recent of these—to mention but one—is that by Arrigoni.[19]

This author enumerates twenty-six medical men in all as presenting themselves earlier or later at the bedside of the illustrious casualty. Of the Italians, apart from the three attending surgeons, the better known should be mentioned, viz., Porta and De Marchi Gherini, both of them already referred to in connection with the first medal; Francesco Rizzoli (1809-1880) of Bologna; Ferdinando Zannetti (1801-1881) of Florence; Ferdinando Palasciano (1815-1891) of Naples; and Agostino Bertani (1812-1886) of Milan. From other parts of Europe there came Richard Partridge (1805-1873) (London); Auguste Nélaton (1807-1873) (Paris); Zoply, a Swiss; the Russian Nikolai Ivanovich Pirogoff (1810-1881); and the Belgian Jean Baptiste Allart.

The fact that so many surgeons concerned themselves with Garibaldi's wound gave rise to a long aftermath of diverging opinion and controversy, the more drawn-out as the surgeons' ambitions and professional niceties became entangled in political considerations as well. So much so that the wound of Aspromonte may well be compared to the pathological riddle of St. Helena. For a long time even the central problem, i. e., whether the bullet was still lodged in the wound or not, remained unsolved and debated. The chief advocate of the theory that the projectile had been retained was Nélaton,[20] who saw Garibaldi on October 28, 1862. Returning to France, he thought out a device for solving the problem conclusively. This was a special kind of probe consisting of a slender silver rod terminating in a

[16] Ripari, Pietro—*Storia medica della grave ferita toccata in Aspromonte dal Generale Garibaldi il giorno 29 Agosto 1862.* Milano, 1863, 123 pp., 1 pl.

[17] Basile, Giuseppe—*Storia della ferita del Generale Garibaldi toccata il 29 agosto 1862 in Aspromonte.* Palermo, 1863, 52 pp., 1 pl.

[18] Albanese, Enrico—*La ferita di Garibaldi ad Aspromonte. Diario inedito della cura, lettere, relazioni militari e mediche, documenti, preceduti da notizie biografico-storiche di G. Pipitone-Federico.* Milano-Palermo-Napoli, 1907, 174 pp.

[19] Arrigoni, Carlo—*La palla d'Aspromonte e la ferita di Garibaldi. Divagazioni storiche, precisazioni chirurgiche.* Torino, 1946. 128 pp. Also published, by instalments, in the periodical *Minerva Chirurgica*, Vol. I (1946).

[20] Rélation chirurgicale de la visite de M. le professeur Nélaton au Général Garibaldi. *Gaz. des. Hôp. civ. et milit.*, 1862: *35*, 510-510.

spherical unglazed porcelain head. Exploring the wound with this instrument, the operator would be enabled to bring its tip into contact with the bullet possibly lodged in it. When such contact was effected, pressure on, and simultaneous rotation of the instrument would make traces of lead adhere to the unglazed spherical porcelain head and produce blackish markings.

Two probes of this kind (fig. 4/X), sent by Nélaton, were in the hands of the attending surgeons on November 15, 1862. On November 20, Basile succeeded in locating with one of these probes a foreign body at the bottom of the fistula. After rubbing the head of the probe against this body lead markings were visible on withdrawal. The diagnosis established, the next step was to widen the opening by means of a prepared sponge (fig. 4/VIII).[21] And so to November 23, when Zannetti introduced a toothed forceps (fig. 4/IX) and with the greatest ease extracted the projectile (fig. 4/VI and VII) which had entered Garibaldi's body 86 days earlier.

The medal shown in fig. 3 was offered Nélaton by the Italian colony of Peru in grateful homage to the man chiefly responsible for the correct diagnosis, and to Zannetti for having extracted the projectile from the wound.[22] It therefore is adorned with the probes devised by the former and the forceps used by the latter.

Artistic considerations compelled the engraver to represent the two blades of the forceps as holding a complete bullet instead of the fragment recovered from the wound. The medal reproduces, in fact, the kind of bullet used with the 1856 model of the " Bersaglieri " (sharpshooter) carbine. It is conical in shape, has circular grooves at its base, and weighed 45, 4 g. (fig. 4/V) while from the wound was extracted a fragment of very irregular shape weighing about 22, 5 g. (fig. 4/VI and VII).

* * * *

It is commonly understood that commemorative medals refer to persons, events or objects generally that have kindled interest and enthusiasm.

In the case of the second medal (fig. 3) this enthusiasm is readily explained by the legendary fascination exercised by Garibaldi, the " Hero of Both Hemispheres " (" Eroe dei due mondi ").

[21] This consisted of a piece of sponge soaked in liquid wax or some liquefied mass in a wax basis. The sponge was squeezed hard and then allowed to cool off. When it was introduced into the opening of a wound (or into some natural cavity to be dilated) the body temperature would melt the wax while the sponge becoming decompressed would by elastic expansion widen the opening.

[22] The volunteers of Aspromonte offered Zannetti another medal (Brettauer 1344) which does not show any surgical instruments.

In order to appreciate the first medal (fig. 1) one must remember the conditions in the first half of the nineteenth century when radical cure of stone in the bladder was possible only by means of lithotomy, an operation which, according to Colliex,[23] exacted a mortality rate of from 20 to 25 per cent. Under these circumstances, the new lithotrite methods were bound to be received with enthusiasm, and more particularly so Heurteloup's percussion procedure, as they appreciably lowered the mortality rate of operations for a disease which at that time seems to have been more widespread than it is today.

Note added in proof. While this article was in print, I obtained knowledge of the publication of a paper by Cavina, Giovanni—La ferita di Garibaldi ad Aspromonte e gli specilli di Nélaton. *Bollettino mensile dell'Ordine dei Medici di Firenze e Provincia*, Vol. 2, June-August 1948 (Reprint of 16 pp.). The silver probes terminating in an unglazed porcelain head are kept at the " Museo Nazionale di Storia delle Scienze " in Florence. The bullet fragment extracted from the wound of Garibaldi is in the possession of his daughter, Clelia, who intends to leave it to the Garibaldi Museum at Caprera (Sardinia).

[23] See above footnote 10.

NOTES AND COMMENTS

A. A. BERTHOLD AND THE FIRST ENDOCRINE EXPERIMENT: SOME SPECULATION AS TO ITS ORIGIN *

THOMAS R. FORBES

There were thirty-nine contributions in the volume for 1849 of Dr. Johannes Müller's *Archiv für Anatomie, Physiologie und wissenschaftliche Medicin* (1). No doubt Dr. Müller, like any editor, permitted himself a few moments of satisfaction and relaxation when the printers had finished their task and the completed volume lay on his desk. As he turned the pages in final inspection, what was his opinion, one wonders, of the third article, by " Prof. Berthold in Göttingen "? This was a short paper, concise and matter of fact, on the transplantation of testes.[1] That Prof. Berthold's report received more than brief attention from Dr. Müller or any one else is unlikely; it seems not to have been mentioned in print for the next sixty years (3). But the observations which the German physiologist set forth established a new science.

Arnold Adolf Berthold (1803-1861), physician and investigator (he also discovered, with Bunsen, the use of a preparation of hydrated oxides of iron as an antidote for arsenic poisoning (4)), relates in his little paper (1) how he caponized six young cockerels, then returned single testes to the body cavities of some of the birds. The grafts, placed among the intestines, became vascularized. Berthold observed that the host birds continued to exhibit the sexual behavior and accessories of normal young roosters. At autopsy he found that the nerve supply of the grafted testes had not been re-established. Berthold concludes:

> Da nun aber an fremde Stellen transplantirte Hoden mit ihren ursprünglichen Nerven nicht mehr in Verbindung stehen können, und da es, wie aus dem dritten Satze einleuchtet, keine specifischen, der Secretion vorstehenden Nerven giebt, so folgt, dass der fragliche Consensus durch das productive Verhältniss der Hoden, d.h. durch deren Einwirkung des Blutes auf den allgemeinen Organismus überhaupt, wovon allerdings das Nervensystem einen sehr wesentlichen Theil ausmacht, bedingt wird (1, pages 45-46).

In other words, since maintenance of sexual behavior and appearance

* Read before the Beaumont Club, Yale University, on 13 May 1949.

[1] D. P. Quiring has made an English translation (2) of the obscure Berthold paper.

could not have been accomplished by the nerves, which were severed, the results must have been due to a contribution of the testes to the blood and then to the action of the added substance throughout the entire body. (The term *hormone* was to be coined later by William B. Hardy (3, page 2)). Here, in a magnificent experiment, was the first proof of endocrine function as we now understand it.

While Berthold's demonstration is clear enough, an important and related question appears to have been left unanswered. *Why* did he do the experiment? What line of reasoning led him to devise this research? We must remember that before 1849 endocrinology as such did not exist. It is true that a realization of the results of castration had come down from antiquity, but without actual explanation. John Hunter had shown by 1771 that transplantation of rooster testes to hens was feasible (5), but the writer has found no indication that Berthold was aware of Hunter's work. It is difficult to believe that intuition or whim alone could have been responsible for a crucial experiment. What, then, was the origin of his hypothesis?

Berthold has not, to the writer's knowledge, left a direct answer to this question; therefore, perhaps we are entitled to a guess or two. His list of publications includes three editions (6, 7, 8) of a textbook of physiology. All three editions were published before his classic paper, and they give us some clues. For the sake of background, the theory of pangenesis, inherited in its elements from the Greeks, requires mention. According to the theory, each part of the body of a prospective parent contributes a particle or molecule for assembly, in the reproductive tract, into an aggregate capable of producing a miniature offspring resembling the parent. This idea, an interesting predecessor, in a sense, of the modern concept of chromosomes and genes, was re-interpreted by several naturalists, among them Maupertuis, Buffon, and Darwin (9).

Each of the three editions of Berthold's textbook contains roughly the same passage presenting his theory of inheritance. Translated, the 1848 edition states (8, pages 568-569):

> Up to a certain time in the development of the individual, the sex organs conduct themselves as ordinary structures belonging to the organism, but when the individual is sufficiently developed, the organs begin their sexual activity. They do not create a new being, but the individual organism serves itself as their intermediary in the production of the new being. The mediating organs [*in the 1829 edition*, the organs responsible for the animal's ability to reproduce] are secretors or glands; what they form, they produce like other glands, from the general humoral aggregate, from the blood. But just as the glands produce not genuine educts [*i. e.*, substances separated unchanged from the blood] but products [*i. e.*, new substances], so also

the material for generation does not exist as such in the blood; rather, it is only prepared therefrom. This is a concept completely at variance with the theory of Buffon that each organ produces a miniature likeness which subsequently is deposited in the sex organ; if it does not reach its destination, it sometimes gives rise to an intestinal worm.

Berthold goes on to emphasize that the sex organs are significant only as intermediaries in the perpetuation of the species. But, he continues,

> . . . in order to be able to function for the entire organism they [the gonads] must have formed and developed themselves in connection with the entire organism and its systems and organs. . . . This relation . . . is mediated chiefly through two processes, namely, through the nervous and vegetative systems. The nervous system is above all the regulator of the functions of the animal organism, and from the blood proceeds all formation and secretion, including the [secretion] of the material for procreation. Certain it is that from the blood by means of the action of the testes and ovaries the seminal and egg fluid is produced from which the sperm and egg cells are formed; that these fluids can be extracted from the blood may be explained [by assuming] that each organ through which the blood flows acts according to its particular nature upon it [the blood] and modifies it according to its particular nature. Such a quality of the blood, wherein the organism as a whole is represented with its characteristics comprises, in relation to the characteristic vital manifestations of the sex organs, the special reason for the formation of the material for reproduction. . . .

More briefly, Berthold's idea is about as follows. Each organ of the body makes a specific and characteristic contribution to the blood; the various contributions are pooled in the blood and brought to the gonads. The latter, acting as intermediaries, remove the various substances from the blood and manufacture from them new substances, sperm and ova; these germ cells carry within them the potentiality for forming new structures like those of the parents.[2]

Berthold agrees with Buffon's idea that each part of the body contributes specifically and characteristically to the blood stream; as a matter of fact, we still hold to this theory as far as the endocrine organs are concerned, although we do not accept the principle of Berthold's corollary

[2] The general hypothesis that numerous parts of the body contribute to the blood stream had been set forth in 1775 by Théophile de Bordeu in his *Analyse médicinale du sang*: ". . . chacun (des organes) aussi sert de foyer et de laboratoire à une humeur particulière qu'il renvoie dans le sang après l'avoir préparée dans son sein, après lui avoir donné son caractère radical" (quoted by Neuburger, M.: Théophile de Bordeu (1722-1776) als Vorläufer der Lehre von der inneren Sekretion. *Wien. klin. Wschr.*, 11, 1367-1368, 1911) and in 1801 by J. J. C. Legallois (3). There is no record that either Bordeu or Legallois put the hypothesis to experimental test. nor does Berthold indicate whether his own hypothesis was to any extent derived from those of the earlier writers. $8.50.

(*e. g.*, that insulin is responsible for the formation of the fetal pancreas). But Berthold adds the apparently new idea that the gonads, receiving *aus der allgemeinen Säftemasse, aus dem Blute* the special contributions from every area of the organism, then proceed to manufacture from these contributions something new, the ova and sperm. (Again, actually, this is partly true, since the gonads cannot survive and maintain gametogenesis unless nourished by numerous materials supplied by the blood, but this is not what Berthold meant.) Thus the investigator had two useful ideas at his disposal: organs make specific contributions to the blood stream, and the latter carries the contributions to a special site where they are utilized for a particular purpose.

Thus far we can be reasonably sure of our ground, but hereafter we must speculate. It seems likely that Berthold, familiar with such phenomena as puberty and the results of castration, realized that some hypothesis must be devised to explain the control of the gonads over the sex characters and sexual behavior. In his textbook he had mentioned only the germ cells as products of the gonads, and he had not suggested that the germ cells could function as blood borne regulators of sexual development and function. But if the idea came to him that the testis, like other parts of the body (according to his theory), might, in addition, release a specific product into the blood and that this product might have definite effects on the accessory sex structures, then his hypothesis would have been complete.

It is evident from his paper that there was an alternative hypothesis. The ability of the nervous system to control and integrate many of the activities of the body was well appreciated. The reproductive system is richly supplied with nerves. What part might be played by the latter?

The two hypotheses were now ready for test; if Berthold had thought of a third possible explanation, he does not mention it. A crucial experiment was devised and performed; the results were clear cut, the fact was demonstrated, and the answer was unequivocal. No investigator asks for more.

Why the ingenious physiologist appears to have gone no further with his discovery is not known. He lived for twelve years after publication of his results. Perhaps he lost interest, or perhaps his experiment was ridiculed, or perhaps he did not appreciate that he had clearly marked a path into a new field of science.

REFERENCES

1. Berthold, A. A.: Transplantation der Hoden. *Arch. f. Anat., Physiol., u. wiss. Med., 16,* 42-46, 1849.
2. ———: Transplantation of Testes, trans. by D. P. Quiring. *Bull. Hist. Med., 16,* 399-401, 1944.
3. Rolleston, H. D.: *The Endocrine Organs in Health and Disease, with an Historical Review.* London, pages 2, 18, 390. 1936.
4. Rush, H. P.: A Biographic Sketch of Arnold Adolf Berthold. An Early Experimenter with Ductless Glands. *Ann. Med. Hist., 1* (n. s.), 208-214, 1929.
5. Forbes, T. R.: Testis Transplantations Performed by John Hunter. *Endocrin., 41,* 329-331, 1947.
6. Berthold, A. A.: *Lehrbuch der Physiologie des Menschen und der Thiere.* Göttingen, 1829.
7. ———: *Ibid.,* 1837.
8. ———: *Lehrbuch der Physiologie für Studirende und Aerzte.* Göttingen, 1848.
9. Cole, F. J.: *Early Theories of Sexual Generation.* Oxford, page 174, 1930.

A BIBLIOGRAPHY OF ANATOMICAL BOOKS PUBLISHED IN ENGLISH BEFORE 1800

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The earliest anatomical book to be printed in English was produced by Thomas Vicary in 1548. Of this edition no copy is extant today and our knowledge of its presence comes from references in other works. That Vicary produced an edition during his lifetime is certain even though the next edition (that of 1577) was produced after his death by the surgeons of St. Bartholomew's Hospital. The existence of the earlier edition is noted by John Halle in the prologue of his treatise on anatomy printed in 1565.

As Dr. Frank Payne has shown, Vicary's book is not original but a compilation from a much earlier manuscript in English by an anonymous author but founded on the works of Lanfrank and Mondeville and finished about 1392. This fact explains the archaic character of Vicary's nomenclature.

From 1548 until 1800, the period under review in the present article, the output of anatomical works in English was not large. The present author has been able to trace only 178 separate works which went through a total of 445 editions.

An analysis of these 178 works reveals that no fewer than 139 were by British authors whose books either first appeared in English or were translations of earlier Latin editions.

The remaining 39 works were by Continental authors and were translated either from the Latin or vernacular editions. It is interesting to note that almost an equal number of these translations appeared in the 17th and 18th centuries (19 in the 17th and 20 in the 18th centuries).

	1500-1599	1600-1649	1650-1699	1700-1749	1750-1799	1800 and after	Total
ITEMS	6	9	44	51	68	—	178
EDITIONS	13	21	101	109	156	45	445

FIG. 1.

Anatomical books published in English before 1800.

*From the Department of Anatomy, University of Melbourne, Australia.

It will be seen from the table (see fig. 1) that the majority of the 178 works appeared in the last 100 years of the period under review and that there was a gradual increase in the number of both items and editions for each consecutive 50 years, the largest number in each section appearing during the period 1750-1799. This increase can be explained not only by the general rise of population in the United Kingdom but also by the increase in the number of medical schools which occurred during the last half of the 18th century. The popularity of the Edinburgh medical school is reflected in the increasing number of anatomical works printed in that city during the 18th and early 19th centuries but especially from 1750-1800. The works printed in Edinburgh were predominantly those of the Scottish anatomists and surgeons, especially the Monros and the Bells.

It is interesting to notice that at various periods one or another work has caught the popular fancy and has been issued and reissued in many editions, in some instances over a long period of time. This popularity can be explained in several ways. Thomas Vicary's *The Englishman's Treasure* was popular because, firstly, it was almost alone in its field and, secondly, it was a mixture of anatomy and surgery and therefore would appeal to the barber-surgeons and the itinerant and unqualified practitioners that abounded during the 16th and early 17th centuries. It remained popular for 66 years and went through at least 10 editions.

Nicholas Culpeper's *A Directory for Midwives* was printed primarily for the lay public and its popularity is shown not only by the 18 editions which appeared but by the fact that nearly every copy that has survived is in poor condition, indeed some editions have probably been thumbed out of existence.

The popularity of William Cheselden's *Anatomy of the Human Body* when it first appeared in 1713 was instantaneous and sustained and during the 93 years of its existence went through at least 18 editions including three printed in America. It was a book popular amongst medical students and like students the world over the success of a book they favour is assured.

Another book popular amongst medical students was James Keill's *The Anatomy of the Humane Body Abridged* which went through at least 20 editions between 1698 and 1774. Its popularity was assured because it was a digest of anatomy and contained within its small compass a very complete description of the human frame. It is a book which has received but scant attention from anatomical writers but is one which deserves closer study for it is full of original ideas and above all is not a slavish copy of the earlier writings, and this probably explains its well merited popularity.

A popular dissecting manual was John Innes' *Short Description of the Human Muscles* which went through 11 editions in 53 years, and most copies show evidence of being placed on the cadaver in the dissecting room and nearly all are well thumbed.

Another work with a long life was Alexander Monro's *Anatomy of the Humane Bones* which went through at least 16 editions in 91 years and was extensively used by the Edinburgh students during the long Monro regime in that School.

Anatomical works with a surgical flavour which proved popular not so much amongst students as with qualified practitioners were James Cooke's *Mellificium Chirurgiae* (8 editions), Helkiah Crooke's *Microcosmographia* (5 editions), and the various English editions of Ambrose Pare's "Complete works."

Literary piracy was rampant in England especially in the 17th century and, of course, anatomical works were not immune, and it is interesting to notice that the best people were not exempt from this practice. William Cowper got himself into considerable trouble with the Royal Society for translating Bidloo's "Anatomy" and passing it off as his own work. Probably one of the most audacious examples was that provided by John Browne who used the plates of Casserius (albeit slightly altered) in his work on the muscles and then prevailed upon King Charles II to issue him with a Warrant of Copyright for the plates preventing others from using them. He seemed rather proud of this somewhat scurvy trick for he had the Copyright printed rather prominently in the preface to the 1681 edition of his *Compleat Treatise of the Muscles.*

Alexander Monro's *Essay on Comparative Anatomy* was issued anonymously in a pirated edition in 1744 and it was not until 1775 that the first authorised edition was issued by his son Monro Secundus.

The use of someone else's plates without acknowledgement was quite popular, the best example being provided by the extensive use of the woodcuts of Andreas Vesalius which appeared in good or bad copies in books printed in England and on the Continent for several hundred years. It would appear however that Thomas Geminus was one of the earliest to take advantage of the Vesalian plates.

In the list which follows some selection of material has been carried out. Individual papers published in such periodicals as the *Philosophical Transactions of the Royal Society* have not been included. Where a general text of anatomy has been included in a book on another subject and appears on the title page then that book has been listed, e. g. Barbette's *Chirurgical and Anatomical Works.* When there is no mention of anat-

omy on the title page of a book on another subject, although in the text there is the anatomy of a particular region, then that book is not listed, e. g. Dionis' *General Treatise on Midwifery* of 1719.

In compiling this list the greatest difficulty has been to know where to stop and some degree of overlap between the subjects has been inevitable. The author also realises the deficiencies of this list especially in the collation of items.

It was felt that the list would be more helpful to others if as many collations as possible could be given, but this proved to be the author's most difficult task.

The largest collection of historical medical books in Australia is the Cowlishaw Collection, housed in the Gordon Craig Library of the Royal Australasian College of Surgeons. This collection was formed by the late Dr. L. Cowlishaw of Sydney and after his death was purchased by the College. It is rich in the more important anatomical works and has a number of the more uncommon English items. There are also smaller collections, both private and public apart from the author's own, but the total number of English texts is relatively small and the author has only been able to personally check the collation of about 12-15% of the items listed. As a result information has had to be gleaned from other sources. Whenever possible the collation derived from these sources has been double checked and where any doubt has been thrown on the accuracy of a collation then it has not been listed. Because of this, it will be noted that there is no uniformity in the method of setting out the collations in the list which follows.

Abbreviations

l., ll. — leaf or leaves.
p. l. — preliminary leaf or leaves.
pp. — pages.
n. d. — no date.
d. — died.
ca. — circa.
fl. — flourished.

Aitken, John d. 1790.

Principles of osteology or the anatomy of the bones.
Edinburgh: (no printer) 1785. 74pp:: 12 plates.

——A system of anatomical tables with explanations.
London: J. Murray, 1786. oblong folio.
52 plates, 42 of which are printed in red.

——Principles of anatomy and physiology for the use of students.
LONDON: J. Murray, 1786. 2 vols., 8vo. 8pp: 187pp: 52 ll:: 33 plates.
5pp: 162pp: 30 ll:: 25 plates.

ALBINUS, Bernard Siegfried 1697-1770.

Tables of the skeleton and muscles of the human body translated from the Latin.
LONDON: H. Woodfall for John and Paul Knapton, 1749. giant folio.
Engraved title:: 51 plates (16 outline).
Another edition.
EDINBURGH: Balfour and Smellie, 1777. 6pp: 86pp:: 41 plates.

——The explanation of Albinus' anatomical figures of the human skeleton and muscles. Translated from the Latin.
LONDON: J. & P. Knapton, 1754. 24pp: 2pp: 382pp.

——See BRISBANE, J.

——See INNES, J.

ANONYMOUS

An abridgement of anatomy taken from Titian and other the best Italian masters: and adapted to the arts of painting and sculpture.
LONDON: for Edward Cooper, n. d. (circa 1701) folio. 11pp. of plates: 3pp. of tables.

——A compleat system of the blood vessels and nerves, taken from Albinus's edition of Eustachius, also from Ruysch (and others). . . . Translated into English.
LONDON: 1750. folio.
Other editions.
LONDON: J. & P. Knapton, 1754. folio.
LONDON: J. Knapton, 1758. folio. 17 ll:: 11 plates (4 outline).

——Anatomical dialogues; or a breviary of anatomy: wherein all the parts of the human body are concisely and accurately described . . . chiefly compiled for the use of young gentlemen in the navy and army.
LONDON: G. Robinson, 1778. 8vo. 7pp: 371pp: 14 ll:: 10 plates.
Other editions.
LONDON: G. Robinson, 1785. 8vo.
LONDON: G. G. J. and J. Robinson, 1792. 8vo. 7pp: 387pp:: 10 plates.
LONDON: G. G. J. and J. Robinson, 1801. 8vo. 7pp: 387pp:: 10 plates.

——An anatomical essay in two discourses: I. Pointing at many things curious and remarkable in the structure of the viscera . . . II. An anatomical explication of the first six verses of the twelfth chapter of Ecclesiastes.

EDINBURGH: Printed in the year 1702. 16mo. 7 ll: 148pp.

—— A system of anatomy from Monro, Winslow, Innes and the latest authors. Arranged . . . in the order of the lectures delivered by the professor of anatomy in the University of Edinburgh.
EDINBURGH: C. Elliott, 1784. 2 vols., 8vo. 10pp: pp. 11-440
7pp: pp. 8-587:: 16 plates.
Other editions.
EDINBURGH: C. Elliott, 1787. 3 vols., 8vo.
EDINBURGH: W. Creech, 1791. 3 vols., 8vo.
EDINBURGH: W. Creech, 1795. 3 vols., 8vo. 20 plates.
EDINBURGH: W. Creech, 1801. 3 vols., 8vo. 20 plates.
The editor of this item is believed to be Andrew Fyfe.

—— Physical essays on the parts of the human body.
LONDON: John Clarke, 1734. 484pp.

—— References to the anatomical paintings and preparations at the anatomical rooms, Surgeons Square, Edinburgh.
EDINBURGH: J. Moir, 1799. 16mo. 8pp: 111pp.

ARNAUD, George ca. 1698-1774.

A dissertation on hermaphrodites.
LONDON: A. Miller, 1750. 8vo. 8pp: 58pp:: 4 plates.

—— A discourse on the importance of anatomy.
(PARIS) 1767. 4to. Text in English and French. 17pp.

BAKER, Robert

Cursus osteologicus: being a compleat doctrine of the bones; according to the newest and most refined notions of anatomy. To which is annexed . . . an excellent method of whitening, cleansing, preparing and uniting the bones, to form a movable skeleton wherein the bones may have the same motions as in a living subject.
LONDON: J. Dawks for D. Browne, 1697. 8vo. 125pp.
Another edition.
LONDON: T. Leigh, 1699. 12mo. 4pp: 125pp:: 1 table.

BANNISTER, John 1533-1610.

The historie of man, sucked from the sappe of the most approved anathomistes, in this present age, compiled in most compendious fourme, and now published in English for the utilitie of all godly chirurgions within this realme, by John Banister.
LONDON: John Daye, 1578. folio. 112 ll:: 5 woodcuts.

BARBETTE, Paul 1629-1699.

Chirurgical and anatomical works, composed according to the circulation of the blood, and other new inventions of the moderns. Translated out of Low Dutch into English.

LONDON: J. Darby for Moses Pitt, 1672. 12mo. 4p.l: 342pp: 52pp: 6 ll:: 1 plate.

Other editions.

LONDON: Moses Pitt, 1676. 8vo. 7 ll: 394pp: 11 ll: 152pp: 7 ll: 30pp:: Frontispiece and 3 plates.

LONDON: H. Rhodes, 1687. 12mo. 7 ll: 394pp: 7 ll: 2 ll: 119pp: 4 ll:: Frontispiece, 3 plates and one illustration in text.

BARTHOLIN, Thomas 1616-1680.

The anatomical history of . . . . concerning the lacteal veins of the thorax, observed by him lately in man, and beast. Publickly proposed to Michael Lyserus.

LONDON: O. Pulleyn, 1653. 16mo.

This is contained in PECQUET, Jean "New anatomical experiments" 1653 (q. v.).

—— Bartholin's anatomy, made from the precepts of his father, and from observations of all modern anatomists together with his own. Translated and published by Nich. Culpeper and Abdiah Cole.

LONDON: 1654. folio.

Other editions.

LONDON: 1663. folio.

LONDON: John Streater, 1668. folio. 2p.l: 377pp:: 4 plates.

(BAYFORD, Dr.)

A catalogue of anatomical preparations, and some anatomical apparatus, the property of a surgeon.

LONDON: 1769. 8vo.

BEDDEVOLE, Dominique d. 1692.

Essayes of anatomy, in which the construction of the organs and their mechanical operations are clearly explained according to the new hypotheses. (Translated by J. Scougall).

EDINBURGH: G. Mosman, 1691. 16mo. 6p.l: 184pp.

Another edition.

LONDON: Walter Kettilby, 1696. 8vo. 6p.l: 142pp.

BELL, Andrew 1726-1809.

Anatomia Britannica: a system of anatomy . . . illustrated by 109 copper plates from the most celebrated authors in Europe . . . in three parts.

EDINBURGH: for the author, 1798. folio. 12pp: 85pp: 110pp:: 109 plates.

BELL, Sir Charles 1774-1842.

A system of dissections, explaining the anatomy of the human body.

EDINBURGH: Mundell & Son, 1798-1801. 2 vols., folio.
14pp: 127pp:: 20 plates. 25pp:: 4 plates.

Other editions.

EDINBURGH: Mundell & Son, 1799. folio.
12pp: 137pp:: 20 plates: 25 pp:: 4 plates.

BALTIMORE: Samuel Jefferis, 1814. 2 vols., 16mo.

—— An appendix to a system of dissections, containing additional description of the abdominal muscles.

EDINBURGH: Mundell & Son, 1800. folio. 6pp:: 1 plate.

BELL, John 1763-1820.

The anatomy of the bones, muscles, and joints.

EDINBURGH: G. Mudie, Cadell & Davies (1793-1797). 2 vols., 8vo.
29pp: 459pp.
31pp: 496pp.

Another edition.

LONDON: T. N. Longman & O. Rees, 1802. 8 vo. 459pp.

—— Engravings explaining the anatomy of the bones, muscles and joints.

EDINBURGH: John Paterson, 1794. 4to. 3 ll: 22pp: 11: 191pp:: Frontispiece and 29 plates (plus some in outline).

Other editions.

LONDON: T. N. Longman & O. Rees, 1804. 4to. 22pp: 191pp:: 28 plates.
LONDON: 1810. 4to. ::28 plates.

BELL, John and BELL, Sir Charles

The anatomy of the human body.

EDINBURGH: G. Mudie, 1797-1804. 4 vols., 8vo.

Other editions.

NEW YORK: Collins and Perkins, 1809. 4 vols., 8vo.
LONDON: Longman, 1811. 3 vols., 8vo.
NEW YORK: Collins & Co., 1812. 4 vols., 8vo.
LONDON: 1816. 4 vols., 8vo.
NEW YORK: Collins & Co., 1817. 3 vols., 8vo.
NEW YORK: Collins & Co., 1822. 3 vols., 8vo.
LONDON: Longman, 1823. 3 vols., 8vo.
LONDON: Longman, 1826. 3 vols., 8vo.
NEW YORK: Collins & Co., 1827. 3 vols., 8vo.
LONDON: Longman, 1829. 3 vols., 8vo.
NEW YORK: Collins & Co., 1834. 2 vols., 8vo.

BERENGARIO, da Carpi, Giacopo 1470-1530.

ΜΙΚΡΟΚΟΣΜΟΓΡΑΦΙΑ or a description of the little world or body

of man. Being a brief and practical anatomy of the body of man . . . long since composed in Latin by that famous Jacobus Berengarius of Carpus . . . and now done into English . . . by Henry Jackson Chirurgeon.

LONDON: R. I. for Livewell Chapman, 1660. 12mo.
:: Frontispiece and 5 plates.

Another edition.

LONDON: for Livewell Chapman, 1664. 8vo.
7 ll: 367pp:: Frontispiece and 5 plates.

BILS, Louis de 1624-1670.

The coppy of a certain large act . . . touching the skill of a better way of anatomy of man's body.

LONDON: 1659. 12mo. 17pp.

BLANCKEN, Gerard

A catalogue of all the chiefest rarities in the publick theater and Anatomie-Hall of the University of Leyden.

LEYDEN: 1697. 4to.

Other editions.

LEYDEN: 1701. 4to.

LEYDEN: Hubert van der Boxe, 1704. 4to.
15pp:: woodcut on title.

LEYDEN: Hubert van der Boxe, 1707. 4to.
16pp:: woodcut on title.

LEYDEN: 1712. 4to.

LEYDEN: Diewertje van der Boxe, 1727. 4to.

BLUMENBACH, Johann Friedrich 1752-1840.

An essay on generation. Translated from the German by A. Crichton.

LONDON: T. Cadell, 1792. 12pp: 84pp.

BRISBANE, John d. 1776.

The anatomy of painting, or a short and easy introduction to anatomy; being a new edition on a smaller scale of six tables of Albinus, with their linear figures . . . to which is added the anatomy of Celsus.

LONDON: George Scott, 1769. folio. 22pp: 76pp:: 12 plates.

Another edition.

LONDON: 1831. folio.

BROWNE, John 1642-1700?

Proposals for printing a treatise of muscular dissection (in folio) . . . . . written by John Browne.

LONDON: Aug. 28, 1680. (Folio Broadside 18 x 11¼ inches).

——A compleat treatise of the muscles, as they appear in humane body, and arise in dissection; with diverse anatomical observations not yet discover'd. Illustrated by near fourty copper-plates accurately delineated and engraven.

LONDON: Tho. Newcombe for the author, 1681. folio.
15p.l: 213pp:: Portrait & 37 plates.
Other editions. (With somewhat different title).
LONDON: D. Newman, 1683. folio. 14p.l: 213pp:: Portrait & 37 plates.
LONDON: Tho. Milbourne, 1697. folio. 18p.l: 109pp:: Portrait & 40 plates.
LONDON: Tho. Milbourne, 1698. folio.
21p.l: 10pp: 109pp:: Portrait & 42 plates.
LONDON: Tho. Shelmerdine, 1705. folio.

BROWNE, Joseph

A lecture of anatomy against the circulation of the blood, read publicly at Exeter Exchange, the sixth of November last past.

LONDON: for John Nutt (1701). 4to. 9p.l: 30pp:: 1 plate.

BURNS, John 1775-1850.

The anatomy of the gravid uterus.

GLASGOW: J. Mundell, 1799. 8vo. 21pp: 248pp:: 1 plate.
Another edition.
SALEM: Cushing and Appleton, 1808. 21pp: 248pp.

CAMPER, Peter 1722-1789.

The works of the late Prof. Camper on the connexion between the science of anatomy and the arts of drawing, painting and statuary . . . . translated from the Dutch by T. Cogan.

LONDON: C. Dilly, 1794. 4to. 23pp: 175pp:: Portrait and 17 plates.
Another edition.
LONDON: J. Hearne, 1821. 4to. Portrait and 17 plates.

CHAMBERLEN, Hugh 1630-1720.

See MAURICEAU, F.

CHARLETON, Walter 1619-1707.

Natural history of nutrition, life and voluntary motion. Containing all the new discoveries of anatomist's, and most probable opinions of physicians concerning the oeconomie of human nature.

LONDON: for Henry Herringham, 1659. 8vo. :: 6 engravings in the text.

—— Three anatomic lectures, concerning the motion of the blood through the veins and arteries; the organic structure of the heart; the efficient causes of the hearts pulsation read 19, 20, 21, March 1682/3 in the Anatomic Theatre of His Majesties Royal College of Physicians.
LONDON: W. Kettelby, 1683. 4to. 1 p.l: 105pp: 3 ll:: 2 plates.

CHESELDEN, William 1688-1752.

Anatomy of the human body, illustrated with twenty three copper plates of the most considerable parts: all done after the life.
LONDON: N. Cliff, D. Jackson and W. Innys, 1713. 8vo. 269pp:: 23 plates.
Other editions.
LONDON: J. Knapton, 1722. 8vo. 15pp: 326pp:: 31 plates.
LONDON: J. and J. Knapton, 1726. 8vo. 7 p.l: 376pp:: 34 plates.
LONDON: W. Bowyer, 1730. 8vo. 6p. l: 355pp:: 37 plates.
LONDON: W. Bowyer, 1732. 8vo.
LONDON: W. Bowyer, 1740. 8vo. (Large paper). 4 p.l: 336pp:: 40 plates.
LONDON: W. Bowyer, 1741. 8vo. 4 p.l: 336pp:: 40 plates.
LONDON: C. Hitch and R. Dodsley, 1750. 8vo. 4 ll: 334pp: 8 ll:: 40 plates.
LONDON: C. Hitch and R. Dodsley, 1756. 8vo. 6pp: 334pp: 8 ll:: 41 plates.
LONDON: H. Woodfall and R. Dodsley, 1763. 8vo. 334pp:: 40 plates.
LONDON: H. Woodfall, 1768. 8vo. 4 ll: 334pp:: 8 ll:: 40 plates.
LONDON: W. Johnston, 1773. 8vo. 5pp: 334pp: 8 ll:: 40 plates.
LONDON: J. F. and C. Rivington, 1778. 8vo. 5pp: 334pp: 8 ll:: 40 plates.
LONDON: J. F. and C. Rivington, 1784. 8vo. 4 ll: 334pp: 8 ll:: 40 plates.
LONDON: J. Dodsley, 1792. 8vo. 5pp: 334pp: 8 ll:: 40 plates.
BOSTON: J. White, 1795. 8vo. 5pp: 350pp:: 40 plates.
BOSTON: D. West, 1796. 8vo. 46pp:: 40 plates.
(Has title "Anatomical Tables of the Human Body").
BOSTON: 1806. 8vo.

—— An appendix to the 4th edition of the anatomy of the human body.
LONDON: W. Bowyer, 1730. 8vo. 19pp:: 3 plates.

—— Osteographia or the anatomy of the bones.
LONDON: (no printer) 1733. folio. Frontispiece: Title: 6 ll: 20 ll. text with illustrations:: 56 plates with text on back.
Three hundred copies of this item were printed; some few copies were issued with the prints taken off the plates before lettering and these copies have a label inside the front cover which states:—"These prints are the first impression, being taken off before the plates were lettered, which have since been broken to pieces by Mr. Cheselden's order." These latter copies have no engraved frontispiece but a specially printed title page which differs from the ordinary issue. Another issue of the unlettered plates was made with portrait-frontispiece (by Faber after Richardson) dated 1753. The plates were probably original and not a reprint (as the date on the portrait suggests).

—— Cheselden's plates of the human bones, correctly reduced from the original copy.

EDINBURGH: for W. McWilliam, 1816. 8vo. 2p.l: 32pp:: 13 plates.
Other editions.
LONDON: E. Cox, 1818. 12mo. 24pp:: Portrait & 14 plates.
LONDON: E. Cox & Son, 1822. 8vo. 23pp:: Portrait & 14 plates.

—— See DOUGLAS, John.

—— See KENNEDY, P.

CHOVET, Abraham 1704-1799.

A syllabus or index of all the parts that enter the composition of the human body, in twelve lectures. For the use of those that go through the courses of anatomy.

LONDON: for the author, 1732. 4to. 26pp.

—— An explanation of the figure of anatomy, wherein the circulation of the blood is made visible, through glass veins and arteries, with the action of the heart and lungs . . . . . by which means any person tho' unskilled in the knowledge of anatomy may at one view be acquainted with the circulation of the blood.

LONDON: Printed in the year 1737. 4to. :: 1 plate.

CLEGHORN, George 1716-1789.

Index of an annual course of lectures.

DUBLIN: W. Sleater, 1756. 8vo. 56pp.

COGAN, Thomas 1736-1818.

See CAMPER, P.

COLLIGNON, Charles 1725-1785.

Tyrocinium anatomicum: or an introduction to anatomy.

CAMBRIDGE: J. Bentham, 1763. 8vo. 37pp.

—— An enquiry into the structure of the human body relative to its supposed influence on the morals of mankind.

CAMBRIDGE: J. Bentham, 1764-65. 8vo. 1 p.l: 67pp.
Both the above items also appear in " The miscellaneous works of Charles Collignon " Cambridge, 1786. 4to.

COLLINS, Samuel 1618-1710.

A system of anatomy, treating of the body of man, beasts, birds,

fishes, insects and plants, illustrated with many schemes of elegant figures drawn from life.

LONDON: Tho. Newcomb, 1685. 2 vols., folio.
11 p.l: 56pp: 2 ll: 1263pp: 23 ll:: Portrait & 74 plates.

COOK, John

An anatomical and mechanical essay on the whole animal economy.

LONDON: 1730. 2vols., 8vo.

——The new theory of generation according to the best and latest discoveries in anatomy.

LONDON: J. Buckland, 1762. 8vo. 12 ll: 339pp.

COOKE, James 1614-1685.

Mellificium chirurgiae; or the marrow of many good authors.

LONDON: C. Cartwright, 1648. 12mo. 10 p.l: 478pp.
Other editions.
LONDON: T. K. for J. Sherley, 1662. 16mo. 16 p.l: 509pp.
LONDON: J. D. for Benj. Shirley, 1676. 8vo.
10 ll: 872pp: 8 ll:: Portrait & 9 plates.
LONDON: W. and J. Marshall, 1684. 4to.
7 p.l: 616pp: 7 ll:: Portrait & 8 plates.
LONDON: T. Hodgkin for William Marshall, 1685. 4to.
7 p.l: 616pp:: Portrait & 8 plates.
LONDON: W. Marshall, 1693. 4to.
7 p.l: 616pp: 6 ll:: Portrait & 8 plates.
LONDON: John Marshall, 1717. 4to.
7 p. l: 616pp: Portrait and 11 plates.
LONDON: J. Phillips, 1718. 4to.
7 p.l: 616pp:: Portrait and 11 plates.

"The anatomy of human bodies" first appeared in the 1684 edition and was included in all issues after this date.

COUPER, Robert 1750-1818.

Speculations on the mode and appearance of impregnation in the human female; with an examination of the present theories of generation.

EDINBURGH: C. Elliot, 1789. 8vo. 149pp.
This edition was published anonymously.
Other editions.
EDINBURGH: P. Hill, 1797. 8vo. 13pp: 194pp.
LONDON: J. Callow, 1808. 8vo. 13pp: 194pp.

COWPER, William 1666-1709.

Myotomia reformata; or a new administration of all the muscles of humane bodies. Subjoin'd a description of the bones.

LONDON: S. Smith, 1694. 8vo. 10 p. l: 280pp:: 9 plates.
Another edition.
LONDON: R. Knaplock, 1724. folio. 9 p. l: 77p: 194pp:: Engraved frontispiece and 67 plates. (Edited by Richard MEAD).

—— The anatomy of the humane bodies, with figures drawn from the life by some of the best masters in Europe, with large explanations containing new anatomical discoveries.

OXFORD: Sam. Smith and Benj. Walford, 1698. folio.
Portrait: Frontispiece: 68 ll:: 114 plates.
Another edition.
LEYDEN: For Joh. Arn. Langerak, 1737. folio. 68 ll:: 114 plates.

CRAWFORD, John

The human muscles classed as they appear in dissection; together with the synonima of the best authors.

LONDON: for the author, n. d. (last quarter of 18th Century); 4to.
3pp: pp. 4-35.

CRICHTON, Sir Alexander 1763-1856.

See BLUMENBACH, J. F.

CROOKE, Helkiah 1576-1635.

Μικροκοσμογραφια. A description of the body of man: together with the controversies thereto belonging. Collected and translated out of all the best authors of anatomy.

LONDON: William Jaggard, 1615. folio.
10 p. l: 1111pp:: Engraved title and many woodcuts.
Other editions.
LONDON: W. Jaggard, 1616. folio. :: Engraved title and many woodcuts.
LONDONS W. Jaggard, 1618. folio. 8 p. l: 1111pp: 1 l:: Engraved title and many woodcuts.
LONDON: T. and R. Cotes for Michael Sparke, 1631. folio.
60pp: 1012pp:: Engraved title and many woodcuts.
LONDON: R. Cotes and to be sold by John Clarke, 1651. folio.
26pp: 766pp:: Engraved title and 175 woodcuts.

CROSSE, William

A brief treatise of the eyes. Wherein not only the structure of the same is anatomically demonstrated; but the diseases . . . are likewise distinctly describ'd.

LONDON: J. Morphew, 1708. 12mo. 12pp: 132pp.

CRUIKSHANK, William Cumberland 1745-1800.

The anatomy of the absorbing vessels of the human body.

LONDON: G. Nicol, 1786. 4to. 8pp: 192pp:: 3 plates.
Another edition.
LONDON: G. Nicol, 1790. 4to. 8pp: pp. 9-214:: 5 plates.

CULPEPER, Nicholas 1616-1654.

A directory for midwives . . . . . containing the anatomy of the vessels of generation, the formation of the child in the womb, etc.

LONDON: Peter Cole, 1651. 16mo. 16 p.l: 217pp: II ll:: Portrait and 2 plates
Other editions.
LONDON: Printed 1652. 12mo. 8 ll: 120pp: I l.
LONDON: 1653. 12mo.
LONDON: 1656. 12mo.
LONDON: Peter and Edward Cole, 1660. 12mo.
LONDON: 1662. 12mo.
EDINBURGH: G. Swinton and J. Glen, 1668. 12mo.
LONDON: J. Streater, 1671. 8vo. 4 ll: 161pp: 14 ll: 270pp:: 1 plate.
LONDON: G. Sawbridge, 1675-6. 12mo. 3 p.l: 161pp: 7 ll: 6 p.l: 254pp:: I l.
LONDON: G. Sawbridge, 1681. 12mo. 3 p.l: 161pp: 7 ll: 7 p.l: 474pp.
LONDON: 1684. 12mo.
LONDON: 1693. 12mo.
LONDON: J. Churchill, 1700-01. 12mo. 4 p.l: 474pp.
LONDON: 1716. 12mo.
LONDON: T. Norris, 1724. 12mo. 3 p.l: 374pp:: 1 plate.
LONDON: 1755. 12mo.
LONDON: 1762. 12mo.
LONDON: D. Johnston, 1777. 12mo. 4pp: pp. 5-134.

—— See BARTHOLIN, T., VESLING, J.

DAVIS, J.

See VERDUC, J. B.

DIEMERBROECK, Isbrand de 1609-1674.

The anatomy of human bodies, comprehending the most modern discoveries and curiosities in that art . . . translated by Wm. Salmon.

LONDON: E. Brewster, 1689. folio. 616pp: 237pp:: 16 plates.
Another edition.
LONDON: for W. Whitwood, 1694. folio. 21 p.l: 616pp: 4 ll: 1 l: 237pp:: Portrait and 16 plates.

DIONIS, Pierre d. 1718.

The anatomy of humane bodies improv'd according to the circulation of the blood and all the modern discoveries. With an ample dissertation upon the nature of generations and several new systems.

LONDON: for H. Bonwicke, 1703. 8vo. 10 p.l: 451pp: 10 ll:: 20 plates.
Another edition.
LONDON: R. Bonwicke, 1716. 8vo. 10 p.l: 451pp: 10 ll:: 20 plates.

DOUGLAS, G.

See WINSLOW, J. B.

DOUGLAS, James 1675-1742.

Myographiae comparatae specimen: or a comparative description of all the muscles in a man and in a quadruped . . . to which is added an account of the muscles peculiar to a woman.

LONDON: G. Strachan, 1707. 12mo. 36pp: 216pp: 16pp.
Other editions.
EDINBURGH: A. Kincaid and G. Crawford, 1750. 12mo. 32pp: 219pp.
DUBLIN: W. Sleater, 1755. 8vo. 29pp: 265pp.
EDINBURGH: 1760. 8vo.
EDINBURGH: A. Donaldson, 1763. 8vo. 32pp: 240pp.
EDINBURGH: J. Bell, 1775. 8vo. 124pp.
DUBLIN: W. Sleater, 1777. 12mo. 34pp: 264pp.

—— Osteographia veteris ac novae specimen; or an essay towards a new description of the human bones.

LONDON: 1725.

—— A description of the peritoneum and of that part of the membrana cellularis which lies on its outside. With an account of the true situation of all the abdominal viscera in respect of these two membranes.

LONDON: J. Roberts, 1730. 4to. 7pp: 47pp.

—— Nine anatomical figures, representing the external parts, muscles, and bones of the human body. The outlines taken from the figures of Vesalius and Bidloo under the direction of James Douglas.

LONDON: W. G. Douglas, 1748. folio.

DOUGLAS, John d. 1743.

A syllabus of what is to be performed in a course of anatomy, chirurgical operations and bandages.

LONDON: T. Woodward, 1719. 4to. 3pp: 48pp.

—— Animadversions on a late pompous book intituled Osteographia, or the anatomy of the bones by Wm. Cheselden.

LONDON: for the author, 1735. 8vo. 45pp.

DRAKE, James 1667-1707.

Anthropologia nova: A new system of anatomy. With a short rationale of many distempers incident to human bodies.

LONDON: S. Smith and B. Walford, 1707. 2 vols., 8vo.
6 p. l: 11pp: 748pp: 95pp: 8 ll:: 88 illustrations.

Other editions.
LONDON: 1717. 2 vols., 8vo.
LONDON: W. and J. Innys, 1727. 2 vols., 8vo.
12pp: 188: 189-448pp:: 51 plates: 95pp.
LONDON: 1750. 2 vols., 8vo. :: Portrait and 27 plates.

—— The appendix to Dr. Drake's anthropologia nova, or new system of anatomy.

LONDON: W. & J. Innys, 1726. 8vo. 95pp:: 51 plates.
This item was issued with the 1727 edition but also appeared separately.

DUVERNEY, Joseph Guichard 1648-1730.

A treatise of the organ of hearing: containing the structure, the uses and the diseases of all parts of the ear. Translated from the French (by John Marshall).

LONDON: for S. Baker, 1737. 8vo. 12pp: 145pp: 7 ll:: 16 plates.
Another edition.
LONDON: S. Baker, 1741. 12mo. :: 16 plates.

FALCONER, Magnus

A synopsis of a course of lectures on anatomy and surgery.

LONDON: 1777. 8vo. 8pp: 44pp.

FLETCHER, Phineas 1582-1650.

The purple island, or the isle of man.

CAMBRIDGE: Printers to the University, 1633. 4to.
7 ll: 181pp: 1 l: 130pp: 1 l
Another edition.
LONDON: Couchman. 1783. 8vo. 8 ll: 189pp.

FUGITIVE SHEET, Anatomical

The anatomye of the inwards parts of man lyvyely set fourthe and dylengently. (And the corresponding sheet for "the woman").

(LONDON?): (1550?). 2 sheets. folio. (Class 3, Type III, Variant B (Crummer)).

—— Interiorum corporis humani partium viva delineatio.

LONDON: Peter Stent, ca. 1650. folio. Title in Latin over the figures, 3 pages of letterpress in English. (Class 3, Type V, Variants B, C, D (Crummer)).

GATAKER, Thomas

An account of the structure of the eye, with occasional remarks on some disorders of that organ, delivered in lectures at the theatre of Surgeons-Hall.

LONDON: for R. and J. Dodsley, 1761. 8vo. 2 ll: 86pp: 1 l.

GEMINUS, Thomas fl. 1540-1560.

Compendiosa totius anatomie delineatio, aere exarata: per Thomam Geminum.

LONDON: Nycholas Hyll for T. Geminus, n. d. (but 1553?). folio. 59 ll:: 39 plates.

Other editions.

LONDON: Nycholas Hyll for T. Geminus, 1553. folio. 59 ll:: 39 plates.

LONDON: N. Hill for T. Geminus, 1557. folio.

LONDON: N. Hill and J. Kingston for Thomas Geminus, 1559. folio. 61 ll:: 41 plates.

The text of these editions is in English (probably "borrowed" from Vicary) but the plates are those of Vesalius. The first two editions listed are the same issue, some copies having the date 1553 on the title page. The 1557 edition is located by S. T. C. in the Wellcome Historical Museum, whose librarian however states that it does not exist. (See Cushing: *Bio-bibliography of Andreas Vesalius*).

GENGA, Bernardino 1655-1734.

Anatomy improved and illustrated with regard to the uses in designing, demonstrated from the most celebrated antique statues in Rome . . . . the dissections by B. Genga . . . . . the explanations . . . by J. M. Lancisi . . . . . First published in Rome by Dom di Rossi and now reengraved and republished by John Senax.

LONDON: (1723). folio. 2 p. l: 15 ll:: 42 plates.

GIBSON, Thomas 1647-1722.

The anatomy of human bodies epitomiz'd. Wherein all the parts of man's body with their actions and uses are succinctly describ'd according to the newest doctrine of the most accurate and learned modern anatomists.

LONDON: M. Flesher for T. Flesher, 1682. 8vo. 3 p. l: 510pp:: 13 plates. This edition was published anonymously.

Other editions.

LONDON: T. Flesher, 1684. 8vo. 6 p. l: 590pp:: 16 plates.

LONDON: Awnsham Churchil, 1688. 8vo. 9 p. l: 585pp: 10 ll:: 16 plates.

LONDON: A. and J. Churchil, 1694. 8vo. 8 ll: 6pp: 626pp:: 18 plates.

LONDON: A. and J. Churchil, 1697. 8vo. :: 20 plates.

LONDON: A. and J. Churchil, 1703. 8vo. 8 p. l: 632pp:: 20 plates.

LONDON: J. Churchil, 1717. 8vo. :: 20 plates.

LONDON: J. Churchil, 1721. 8vo. 316pp:: 20 plates.

GRAAF, Regnier de 1641-1673.

De succo pancreatico: or, a physical and anatomical treatise of the nature and office of the pancreatick juice . . . . . translated by Christopher Pack.

LONDON: N. Brook, 1676. 8vo. 11 p.l: 151pp: 8 ll:: 3 plates.

GREW, Nehemiah 1641-1712.

Musaeum Regalis Societatis. Or a catalogue & description of the natural and artificial rarities belonging to the Royal Society and preserved at Gresham College. Whereunto is subjoyned the comparative anatomy of stomachs and guts.

LONDON: W. Rawlins for the Author, 1681. folio.
6 ll: 386pp: 3 ll: 43pp:: Portrait and 31 plates.

Another edition.

LONDON: for Hugh Newman, 1694. folio. 6 ll: 386pp: 3 ll: 43pp:: 31 plates.

HALLE, John 1529-1568.

A very fruitful and necessary brief work of anatomy, or dissection of the body of man, compendiously showing the natures, forms and offices of every member from the head to the feet.

LONDON: Thos. Marshe, 1565. 4to.

This item occurs at the end of HALLE's edition of LANFRANC: "A most excellent and learned woorke of chirurgerie" London: Thomas Marshe, 1565. It was not published separately.

HANDLEY, James

Colloquia chirurgica . . . . . To which is added a compendium of anatomy, containing, in a very few words, the principal matters relating to the structure of man's body.

LONDON: C. Bates, 1705. 12mo. 7 p.l: 192pp.

Other editions.

LONDON: A. Bettesworth, 1721. 12mo. 7 p.l: 192pp: 3 ll.

LONDON: A. Bettesworth and C. Hitch, 1733. 12mo. 14 p.l: 1 l: 215pp: 4 ll.

LONDON: C. Hitch, 1734. 12mo. 11pp: 215pp: 5 ll.

The first edition was published anonymously.

——Mechanical essays of the animal oeconomy: wherein not only the conduct of nature in animal secretion but sensation and human generation are distinctly considered and anatomically explained.

LONDON: A. Bettesworth, 1721. 8vo. 14 ll: 425pp: 7 ll.

HARVEY, William 1578-1657.

The anatomical exercises of Dr. William Harvey . . . . . concerning the motion of the heart and blood. With the preface of Zachariah

Wood, Physician at Roterdam. To which is added Dr. James Back, his discourse of the heart.

LONDON: Francis Leach for Richard Lowndes, 1653. 8vo.
19 p. l: 112pp: 10 ll: 123pp: 1 l: 86pp.

Another edition.

LONDON: for Richard Lowndes and Math. Gilliflower, 1673. 8vo.
12 p. l: 107pp: 10 ll: 176 (wrongly numbered 172) pp.

—— Anatomical exercitations concerning the generation of living creatures: to which are added particular discourses of births, and of conceptions.

LONDON: James Young for Octavian Pulleyn, 1653. 8vo.
Portrait: 28 ll: 556 (wrongly numbered 566) pp: Errata leaf.

HARWOOD, Sir Busick 1745-1814.

A system of comparative anatomy and physiology.

CAMBRIDGE: W. H. Lunn, 1796. 4to. 72pp:: 15 plates.

Another edition.

CAMBRIDGE: J. Burges, 1796. 4to. 1 p. l: 72pp:: 15 plates.

—— A synopsis of a course of lectures in anatomy and physiology.

CAMBRIDGE: 1787. 8vo.

Other editions.

CAMBRIDGE: J. & J. Merrill, 1792. 8vo. 7pp: 94pp: 6pp: 62pp.
CAMBRIDGE: 1807. 8vo.
CAMBRIDGE: 1810. 4to.

HAVERS, Clopton d. 1702.

Osteologia nova, or some new observations on the bones and the parts belonging to them . . . . . to which is added a discourse of the cartilages.

LONDON: Samuel Smith, 1691. 8vo. 8 p. l: 294pp: 1 l:: 2 plates.

Another edition.

LONDON: W. Innys, 1729. 8vo. :: 2 plates.

—— See REMMELIN, J.

HAWORTH, Samuel

Anthropologia; or a philosophic discourse concerning man, being the anatomy both of his soul and body.

LONDON: for Stephen Foster, 1680. 8vo. 17 p. l: 211pp.

HEISTER, Lorenz 1683-1758.

Compendium of anatomy containing a short but perfect view of all parts of humane bodies, with the modern discoveries and a variety of curious observations never before made publick.

LONDON: T. Combes, 1721. 8vo. 7 p. l: 399pp: 8 ll:: 4 plates.
Another edition.
LONDON: W. Innys and J. Richardson, 1752. 8vo. 8pp: 412pp: 2 ll:: 8 plates

HERRINGHAM, Henry

Anthropologie abstracted: or the idea of human nature reflected in brief philosophicall and anatomicall collections.
LONDON: Henry Herringham, 1685. 201pp: 5pp.

HIGHMORE, Nathaniel 1613-1648.

The history of generation, examining the several opinions of divers authors, especially that of Sir Kenelm Digby in his discourse of bodies. With a general relation of the manner of generation.
LONDON: R. N. for John Martin, 1651. 16mo. 8 ll: 141pp: 1 l:: 2 plates.

HOOPER, Robert 1772-1835.

The anatomist's vade-mecum.
LONDON: 1797. 12mo.
Other editions.
LONDON: Murray and Highley, 1800. 12mo. 8pp: 219pp.
BOSTON: Thomas and Andrews, 1801. 12mo. (First American edition). 226pp.
LONDON: for Murray and Highley, 1802. 12mo. 322pp.
LONDON: for John Murray, 1804. 16mo. 44pp: 376pp.
WINDSOR: Preston Merrifield, 1809. 8vo. (Second American edition). 262pp.
LONDON: Longman, 1820. 12mo. 23pp: 421pp.

HUNTER, John 1728-1793.

The natural history of the human teeth.
LONDON: J. Johnson, 1771. 4to. (Two issues, with slight differences in the titles). 4 p. l: 128pp: 8 ll:: 16 plates.
It was also issued in two parts in 1778 (LONDON: J. Johnson 4to.), the second part being a supplement.
Other editions.
LONDON: J. Johnson, 1778. 4to. Second edition (Parts 1-2 together). 2 p. l: 128pp: 8 ll:: 16 plates.
LONDON: for J. Johnson, 1803. 4to. 2 p. l: 246pp: 19 ll: 16 plates.

—— Observations on certain parts of the animal oeconomy.
LONDON: 13 Castle Street, Leicester Square, 1786. 4to. 3 p. l: 225pp:: 18 plates.
Another edition.
LONDON: 13 Castle Street, Leicester Square, 1792. 4to. 3 ll: 273pp: 2 ll:: 18 plates.

HUNTER, William 1718-1783.

The anatomy of the human gravid uterus exhibited in figures.

BIRMINGHAM: J. Baskerville, 1774. atlas folio. 4 p.l: 17 ll:: 34 plates.
This was reprinted in 1851 by the Sydenham Society.

—— Anatomical description of the human gravid uterus and its contents.

LONDON: J. Johnson, 1794. 4to. 12pp: 88pp.
This is the text for the first item, issued after Hunter's death by his nephew Matthew Baillie.

—— Two introductory lectures to his last course of anatomical lectures; to which are added some papers relating to Dr. Hunter's intended plan for establishing a museum in London for the improvement of anatomy, surgery and physic.

LONDON: J. Johnson, 1784. 4to. 130pp:: 1 plate.

INGRAM, Dale 1710-1793.

See VERDIER, C.

INNES, John 1739-1777.

A short description of the human muscles chiefly as they appear on dissection. Together with their several uses, and the synonyma of the best authors.

LONDON: 1776. 12mo.
Other editions.
LONDON: John Murray, 1778. 12mo. (Corrected by Alex Munro). 11pp: pp. 12-251.
EDINBURGH: C. Elliot, 1784. 12mo. 11pp: pp. 12-240.
LONDON: W. Mackie, 1791. 16mo. 240pp.
LONDON: For T. W. Hawkins, 1792. 12mo. 180pp.
LONDON: For T. Cox, 1804. 12mo. 10pp: 140pp: 8 ll:: 17 plates: 17 ll.
LONDON: E. Cox, 1813. 12mo. 10pp: 140pp: 17 ll:: 16 plates.
LONDON: E. Cox, 1815. 12mo. 10pp: 152pp:: 16 plates.
LONDON: T. Tegg, 1822. 12mo. 12pp: 180pp:: 18 plates.
GLASGOW: J. Cameron, 1824. 12mo. 10pp: pp. 11-184:: 17 plates.
LONDON: E. Cox, 1829. 12mo. 152pp.

—— Eight anatomical tables of the human body; containing the principal parts of the skeleton and muscles represented in the large tables of Albinus.

EDINBURGH: Balfour and Smellie, 1776. 4to. 52pp:: 8 plates.
Other editions.
EDINBURGH: C. Elliott, 1779. 8vo. 4pp: 52pp:: 8 plates.
EDINBURGH: 1783. 4to. 52pp:: 8 plates.

IRETON, John

See REMMELIN, J.

JACKSON, Henry

See BERENGARIO da CARPI.

JENTY, Charles Nicholas

A course of anatomico-physiological lectures on the human structure and animal oeconomy . . . . To which are prefixed, two essays on the arts of dissecting, injecting, and making anatomical preparations.

LONDON: J. Rivington & J. Fletcher, 1757. 2 vols., 8vo. 215pp: 400pp: 600pp.

Another edition.

LONDON: J. Lloyd & D. Steel, 1765. 3 vols. 8vo.

—— The demonstration of a pregnant uterus of a woman at her full term, in six tables as large as nature, done from the pictures painted after dissections by Mr. Van Riemsdyk.

LONDON: 1758. atlas folio.

JOHNSON, Thomas d. 1644.

See PARE, A.

KEILL, James 1673-1719.

The anatomy of the humane body abridged; or a short and full view of all the parts of the body: together with their severall uses drawn from their composition and structures.

LONDON: William Kebelwhite, 1698. 16mo. 12 ll: 328pp: 4 ll.

This edition was published anonymously.

Other editions.

LONDON: William Kebelwhite, 1703. 12mo. 335pp.
LONDON: R. Smith, 1703. 12mo. 5 p.l: 335pp.
LONDON: 1708. 12mo.
LONDON: 1710. 12mo.
LONDON: 1714. 12mo. 384pp.
LONDON: for R. Smith, 1718. 12mo. 5 p.l: 384pp.
LONDON: for John Clarke, 1723. 12mo. 5 p.l: 369pp: 3pp.
LONDON: for J. Clarke, 1731. 12mo. 5 ll: 361pp.
LONDON: J. Clarke, 1738. 12mo. 4 p.l: 361pp.
LONDON: for J. Clarke, 1742. 12mo. 4 p.l: 361pp.
LONDON: John Clarke, 1746. 12mo. 361pp.
EDINBURGH: 1747. 12mo.
LONDON: 1759. 12mo.
LONDON: 1760. 12mo.
EDINBURGH: D. Gray, 1760. 12mo. 3 p.l: 306pp.

LONDON: 1769. 12mo. 361pp.
EDINBURGH: A. Donaldson, 1770. 12mo. 306pp.
LONDON: J. and F. Rivington, 1771. 12mo. 3 p.l: 306pp.
EDINBURGH: 1774. 12mo.

——An account of animal secretion, the quantity of blood in the humane body, and muscular motion.

LONDON: For G. Strahan, 1708. 8vo. 28pp: 187pp.
Other editions.
LONDON: George Strahan, 1717. 8vo. 28pp: 233pp. (under the title: "Essays on several parts of the animal oeconomy").
LONDON: George Strahan, 1738. 8vo. 48pp: 295pp. (title as for 1717 edition but with additional matter).
The third edition of this item was published in Latin ("Tentamina medico-physica," LONDON: G. Strahan, 1718. 8vo.).

KENNEDY, Peter

Ophthalmographia; or a treatise of the eye . . to which is added an appendix of some of the diseases of the ear.

LONDON: for Bernard Lintott, 1713. 8vo.
12 ll: 109pp: 1 l:: folding frontispiece.

——A supplement to Kennedy's ophthalmographia . . in which is observed the plagiarism from that treatise contained in Dr. Brancken's Farriery. Remarks on Dr. Porterfields motion of the eyes . . . . . also on W. Cheselden; his observations on the eye in his anatomy . . .

LONDON: 1739. 8vo. 1 l: 166pp.

LANCISI, J. M. 1654-1720.

See GENGA, B.

LANGRISH, Browne d. 1759.

A new essay on muscular motion.

LONDON: A. Bettsworth & C. Hitch, 1733. 4to. 103pp.

LE CLERC, Daniel (1652-1728) and MANGET, Jean Jacques Jacob (1652-1742).

Bibliotheca anatomica . . . . containing a description of the several parts of the body . . . wherein are not only all the tracts that are in the second edition of the Bibliotheca anatomica . . . . but an addition of near double that number.

LONDON: In the Savoy, 1711-1714. 3 vols., 4to. 5 ll: 746pp: 3 ll; 4 ll: 687pp: 2 ll; 4 ll: 654pp: 7 ll:: 38 plates.

LETTSOM, John Coakley 1744-1815.

Hints respecting human dissection.

LONDON: 1795. 8vo. 27pp.

LYSER, Michael 1626-1659.

The art of dissecting the human body in a plain, easy and compendious method, with the several necessary instruments, curiously engraved. Translated from the Latin by G. Thompson.

LONDON: J. Davidson, 1740. 8vo. 12pp: 276pp:: 2 plates.

MANGET, Jean Jacques Jacob 1652-1742.

See LE CLERC, D.

MARSHALL, John

See DUVERNEY, J. G.

MAURICEAU, François 1637-1709.

The accomplisht midwife, treating of the diseases of women with child and in child-bed . . . . . (To which is prefixed an anatomical treatise, all illustrated with divers fair figures, correctly engraven in copper.) Translated by Hugh Chamberlen.

LONDON: B. Billingsley, 1673. 8vo. 10 p. l: 437pp: 3 ll:: 16 plates.
(The portion in brackets above appears on the title-page of later editions but NOT the first).

Other editions.

LONDON: Darby, 1683. 8vo.
LONDON: A. Bell, 1697. 12mo. 47pp: 352pp:: 8 plates.
LONDON: A. Bell, 1710. 8vo. 44pp: 373pp:: 8 plates.
LONDON: A. Bell, 1718. 8vo. 44pp: 373pp: 3 ll:: 8 plates.
LONDON: T. Cox, 1727. 8vo. 44pp: 373pp: 4 ll:: 8 plates.
LONDON: 1736. 8vo.
LONDON: T. Cox and J. Clarke, 1752. 8vo. 42pp: 375pp: 3 ll:: 8 plates.
LONDON: R. Ware, 1755. 8vo. 42pp: 375pp: 3 ll:: 8 plates.

MEAD, Richard 1673-1754.

See COWPER, W.

MOLINES, Allan d. 1690.

An anatomical account of the elephant accidentally burnt in Dublin on 17 June 1681; together with a relation of new anatomical observations on the eyes of animals. By A. M.

LONDON: Sam. Smith, 1682. 4to. 72pp:: 2 plates.

MOLINS, William

Μυσκοτομια or the anatomical administration of all the muscles of an human body as they arise in dissection, as also an analitical table, reducing each muscle to its use and part, collected for private use by William Molins . . . . and published for the general good of all practitioners in the said art.

LONDON: E. Husband, 1648. 8vo. 6 p.l: 111pp.
Other editions.
LONDON: for Abel Roper, 1676. 12mo.
LONDON: W. Rogers, 1680. 8vo. 128pp.

MONRO, Alexander (primus) 1697-1767.

The anatomy of the humane bones.

EDINBURGH: W. Monro, 1726. 8vo.
Other editions.
EDINBURGH: W. Monro, 1732. 8vo. 8pp: 344pp: 4pp. 41pp.
EDINBURGH: for W. Monro, 1741. 12mo. 9pp: 324pp: 80pp.
EDINBURGH: Hamilton and Balfour, 1746. 16mo. 9pp: 395pp.
EDINBURGH: Hamilton and Balfour, 1750. 12mo. 7pp: 429pp.
EDINBURGH: 1758. 12mo.
EDINBURGH: for E. Hamilton, 1763. 12mo. 7pp: 410pp.
EDINBURGH: 1768. 12mo.
EDINBURGH: for Robert Clark, 1775. 8vo. 9pp: 400pp.
EDINBURGH: for William Auld, 1776. 12mo. 9pp: 400pp.
EDINBURGH: 1777. 12mo. 410pp.
EDINBURGH: J. Dickson, 1780. 12mo. 312pp.
EDINBURGH: for W. Gordon, 1782. 8vo. 7pp: 312pp: 12pp: 65pp:: Portrait.
EDINBURGH: 1788. 8vo. 172pp. (double columns)
EDINBURGH: 1810. 12mo.
EDINBURGH: T. Bryge and Co., 1817. 12mo. 36pp: 312pp.
The second and subsequent editions have added a treatise on the nerves and a description of the lacteal sac and duct.

—— An essay on comparative anatomy.

LONDON: J. Nourse, 1744. 12mo. 22pp: 138pp: 1 leaf.
This is the pirated first edition issued anonymously.
Other editions.
LONDON: J. Nourse, 1775. 12mo. 22pp: 138pp.
EDINBURGH: W. Gordon, 1782. 8vo. 12pp: 65pp.
EDINBURGH: C. Elliott, 1783. 12mo. 10pp: pp. 11-136.

—— The works, published by his son Alexander Monro, M. D.
EDINBURGH: 1781. 4to. 24pp: 791pp:: 7 plates.

MONRO, Alexander (secundus) 1732-1817.

Observations, anatomical and physiological wherein Dr. Hunter's claim to some discoveries is examined.
EDINBURGH: Hamilton, Balfour and Neill, 1758. 8vo. 1 p.l: 80pp:: 2 plates.

——Observations on the structure and functions of the nervous system.
EDINBURGH: W. Creech, 1783. folio. 10pp: 176pp:: 47 plates.

——A description of all the bursae mucosae of the human body.
EDINBURGH: 1785.
Another edition.
EDINBURGH: C. Elliott, 1788. folio. 60pp:: 10 plates.

——Description of a human male monster.
EDINBURGH: 1792. 4to. 18pp:: 4 plates.
Another edition.
EDINBURGH: 1793. 4to.

——Observations on the muscles . . . . with an appendix in which the pretension of Dr. G. Blane is proved to be unfounded.
EDINBURGH: I. Dickson, 1794. 4to. 78pp:: 4 plates.

——Three treatises, on the brain, the eye, and the ear.
EDINBURGH: Bell and Bradfute, 1797. 4to. 8pp: pp. 9-263:: 20 plates.

N . . . . . , M.

Anatomy epitomized and illustrated containing;
I. A concise and plain description of all the parts of the human body.
II. A large and choice collection of sculptures.
LONDON: J. Noon, 1737. 8vo. 2 p.l: 182pp:: 17 plates.

NESBITT, Robert d. 1761.

Human osteogeny explained in two lectures read in the anatomical theatre of the Surgeons of London, anno 1731.
LONDON: T. Wood, 1736. 8vo. 18pp: 170pp:: 6 plates.

NICHOLSON, Henry

A brief treatise of the anatomy of humane bodies . . . Demonstrating the circulation of the blood, and all muscular motion, from the pressure of the atmosphere.
LONDON: for Daniel Browne, 1709. 8vo. 6pp: 34pp.

NORTHCOTE, William d. 1783.

A concise history of anatomy from the earliest ages of antiquity.

To which is annexed a few thoughts on the uses of anatomy and rules for giving a course of anatomical lectures.

LONDON: for T. Evans, 1772. 8vo. 1 l: 176pp.

—— The anatomy of the human body designed (chiefly) for the uses of naval practitioners.

LONDON: T. Becket and P. A. de Hondt, 1772. 8vo. 16pp: 448pp: 12 ll.

PACK, Christopher

See GRAAF, R. de

PARE, Ambrose 1510-1590.

The workes of that famous chirurgion Ambrose Parey. Translated out of Latine and compared with the French by Th. Johnson.

LONDON: Th. Cotes and R. Young, 1634. folio. 7 p. l: 1173pp: 11 ll:: Engraved title and 323 woodcuts.

Other editions.

LONDON: R. Cotes and W. Dugard, 1649. folio. 11 p. l: 787pp: 6 ll: 50pp: 3 ll. Engraved title and 323 woodcuts.

LONDON: E. C., 1665. folio. 8 p. l: 778pp: 2 ll: 50pp: 7 ll. Woodcuts as above.

LONDON: Mary Clark, 1678. folio. 10 p. l: 713pp: 2 ll: 44pp: 9 ll. Woodcuts as above.

LONDON: Jos. Hindmarsh, 1691. folio. 10 p. l: 713pp: 2 ll: 44pp: 9 ll. Woodcuts as above.

PARSONS, James 1705-1770.

A mechanical and critical enquiry into the nature of hermaphrodites.

LONDON: J. Walthoe, 1741. 8vo. 54pp: 156pp:: 3 plates.

—— A description of the human urinary bladder and parts belonging to it; with anatomical figures showing its make, situation etc.

LONDON: J. Brindley, 1742. 8vo. 14pp: 283pp:: 7 plates.

—— The Crounian lectures on muscular motion for the years 1744 and 1745. Read before the Royal Society.

LONDON: C. Davis, 1745. 4to. 8pp: 86pp:: 3 plates.

—— Human physiognomy explained in the Croonian Lectures on muscular motion for the year MDCCXLVI read before the Royal Society.

LONDON: for C. Davis, 1747. 4to. 10 ll: 82pp: 3 ll:: 10 plates.

PARTRIDGE, William

A catalogue of the anatomical preparations, chirurgical instruments etc. of the late William Partridge.

(LONDON: 1766). 8vo.

PECQUET, Jean 1622-1674.

New anatomical experiments . . . As also an anatomical dissertation of the motion of blood and chyle . . . Being an anatomical historie . . . By T. Bartholine.

LONDON: T. W. for Octavian Pulleyn, 1653. 12mo. 4 p.l: 177pp.

PERRAULT, Claude 1613-1688.

Memoires for a natural history of animals, being the anatomical description of several animals dissected by the Royal Academy at Paris. Translated by A. P. (Alexander Pitfield).

LONDON: 1687. folio.
Other editions.
LONDON: 1701. folio.
LONDON: 1702. folio.

PERSON, Claude d. 1758.

Elements of anatomy and the animal economy. Corrected and considerably augmented; with notes by Samuel Foart Simmons.

LONDON: J. Wilkie, 1775. 8vo. 15pp: 396pp:: 3 plates.
Another edition.
LONDON: G. Robinson, 1782. 8vo. 418pp.

PITFIELD, Alexander

See PERRAULT, C.

POLE, Thomas 1753-1829.

The anatomical instructor; or an illustration of the modern and most approved methods of preparing and preserving the different parts of the human body and of quadripeds.

LONDON: Couchman and Fry, 1790. 8vo. 80pp: 304pp: 6 ll:: 10 plates.
Another edition.
LONDON: J. Callow, 1813. 8vo. 24pp: 202pp:: 10 plates.

—— An anatomical description of a double uterus and vagina.

LONDON: 1792. 4to. 6pp:: 1 plate.

PORTERFIELD, William

A treatise on the eye, the manner and phaenomena of vision.

EDINBURGH: for A. Miller and G. Hamilton, 1759. 2 vols., 8vo. 31pp: 450pp:: 5 plates. 35pp: 434pp:: 3 plates.

—— See KENNEDY, P.

PUGH, John

A treatise on the muscular action.

LONDON: C. Dilly, 1794. 8vo. 9pp: pp. 5-16: 106pp:: 30 plates. (15 outline).

RACKSTROW'S Museum

A brief description of those curious and excellent figures of the human anatomy in wax.

LONDON: (1780?). 8vo. 12pp.

——A descriptive catalogue of Rackstrow's Museum, consisting of a large and very valuable collection of most curious anatomical figures and real preparations.

LONDON: 1787. 8vo. 32pp.
Other editions.
LONDON: 1792. 8vo. 32pp.
LONDON: 1794. 8vo. 24pp.

READ, Alexander 1586?-1641.

Somatographia Anthropine: A description of the body of man, by artificiall figures representing the members and fit termes expressing the same, set forth either to pleasure or to profite those who are addicted to this study by W. J., printer.

LONDON: W. Jaggard, 1616. 8vo. 1 p.l: 154 ll:: 150 woodcuts.
Another edition.
LONDON: Thos. Cotes and are to be sold by Michael Sparke, 1634. 8vo. 154pp: 117pp:: 154 woodcuts.

——A Treatise of all the muscles of the whole bodie. By Alexander Read, Doctor of Physicke, Brother of the Worshippful Company of Barbour Chirurgians. The author is to read of this subject this next Shrovetide publickly, in the Theatre erected this last yeare by the aforesaid company, at their extraordinary great charges.

LONDON: R. Young for F. Constable, 1637. 12mo. 3 ll: 150pp: 17 ll.
This item is included in "The workes of that famous physitian Dr. Alexander Read." LONDON: E. G. for Richard Thrale, 1650. 4to. (8 ll: 274pp: 1 l: 206pp: 2 ll: 44pp: 4 ll.) and also in the 1659 edition of the same work (LONDON: R Thrale, 1659. 4to. 5 p.l: 524pp: 4 ll.).

——The manuall of the anatomy or dissection of the body of man, containing the enumeration and description of the parts of the same, which usually are shewed in the publicke anatomicall exercises.

LONDON: 1634. 12mo.

Other editions.

LONDON: 1637. 12mo.

LONDON: J. Haviland for F. Constable, 1638. 12mo.
:: Engraved frontispiece and 5 plates.

LONDON: R. Bishop for F. Constable, 1642. 12mo.
4 p.l: 446pp:: 5 plates: 6 ll.

LONDON: 1650. 12mo.

LONDON: for Richard Thral, 1655. 12mo. 5 p.l: 446pp: 6 ll::
Engraved frontispiece and 5 plates.

LONDON: 1658. 12mo.

REMMELIN, Johann 1588-1680.

A survey of the microcosme; or the anatomie of the bodies of man and woman, wherein the skin, veins, nerves, muscles, bones, sinews and ligaments thereof are accurately delineated and so disposed by pasting as that each part of said bodies both inward and outward are exactly represented. Englished by John Ireton.

LONDON: Joseph Moxon, 1675. folio. 4pp:: 4 plates.

Other editions.

LONDON: 1691. folio.

LONDON: Dan. Midwinter and Tho. Leigh, 1702. folio. Title:: 4 plates.

LONDON: for Daniel Midwinter, 1738. folio. Title:: 4 plates.
(Text on back of plates).

The name of Clopton HAVERS appears on the title page of the 1691, 1702 and 1738 editions, but it would seem doubtful that he had anything to do with their issue.

RIDLEY, Humphry 1653-1708.

The anatomy of the brain. Containing its mechanism and physiology: together with some new discoveries and corrections of ancient and modern authors upon that subject.

LONDON: Sam. Smith and Benj. Walford, 1695. 8vo.
6 p.l: 200pp: 12 ll:: 5 plates.

RIOLAN, Jean, the younger. 1577-1657.

A sure guide: or the best and nearest way to physick and chirurgery: that is to say, the arts of healing by medicine, and manual operation. An anatomical description . . . in six books. Englished by Nich. Culpeper and W. Rand.

LONDON: P. Cole, 1657. folio. 6 p.l: 120 ll. (wrongly numbered 288pp.): 30 ll:: 24 plates.

Other editions.

LONDON: John Streater, 1671. folio. 4 ll: 288pp: 6 ll:: 24 plates.

LONDON: G. Sawbridge, 1671. folio. 3 p.l: 288pp:: 24 plates: 30 ll.

ROBINSON, Bryan 1680-1754.

A treatise of the animal oeconomy.

DUBLIN: George Grierson, 1732. 8vo. 4pp: 283pp:: 1 plate.

ROSS, Alexander 1591-1654.

Arcana microcosmi; or the hid secrets of man's body discovered; first in an anatomical duel between Aristotle and Galen, about the parts thereof; secondly by a discovery of the strange and marvellous diseases, symptomes and accidents of man's body.

LONDON: 1651. 12mo. 8 p. l: 292pp.

Another edition.

LONDON: Tho. Newcomb for John Clark, 1652. 8vo. 7 p. l: 267pp: 4 ll.

ROWLEY, William 1742-1806.

On the absolute necessity of encouraging instead of preventing or embarrassing the study of anatomy; with a plan to prevent the violating of the dormitories of the defunct. Addressed to the legislature of Great Britain.

LONDON: Printed in the year 1795. 8vo. 18pp.

RUTTY, William 1687-1730.

A treatise of the urinary passages. Containing their description, powers and uses; together with the principal distempers that affect them.

LONDON: T. Worrall, 1726. 4to. 3 p. l: 54pp: 3 ll:: 4 plates.

Another edition.

LONDON: J. Whiston and J. Woodyer, 1750. 4 p. l: 67pp: 4 ll:: 4 plates.

SALMON, William 1644-1713.

Synopsis Medicinae: . . . Liber Quartus: Anatomica. Representing to the mind or apprehension a true and compleat idea of the whole humane frame . . . extracted out of the works of the best anatomists, as Vesalius, Lavrentius, Spigelius, Bauhinus, Malpigius, Crook, Veslingus, Riolanus, Bartholine and others.

LONDON: Tho. Dawks, 1680. 8vo.

Another edition.

LONDON: J. Dawkes, 1695. 8vo.

—— Ars Anatomica or the anatomy of human bodies.

LONDON: D. Browne, 1714. 8vo. 3 p. l: 552pp:: Portrait & 29 plates.

—— See DIEMERBROECK, I., RIOLAN, J.

SCHAW, William 1714-1757.

A scheme of the lectures on the animal oeconomy, proposed to begin on the 23 March 1741.

LONDON: 1741. 8vo.

SCOUGALL, J.

See BEDDEVOLE, D.

SENAX, J.

See GENGA, B.

SHELDON, John 1752-1808.

The history of the absorbent system, part the first: containing the chylography or description of the human lacteal vessels.

LONDON: for the author, 1784. folio. 6 p.l: 6 ll:: 6 plates: 6 ll: 52pp: 1 l.
This was the only part published.

SIMMONS, Samuel Foart 1750-1813.

The anatomy of the human body.

LONDON: John Murray, 1780. 8vo.
Vol. I only was published.

—— See PERSON, C.

SMELLIE, William 1697-1763.

A set of anatomical tables, with explanations and an abridgment of the practice of midwifery.

LONDON: 1754. folio. 20 ll:: 39 plates.
Other editions.
LONDON: 1761. folio. 22 ll:: 39 plates.
EDINBURGH: 1780. 8vo.
EDINBURGH: C. Elliott, 1785. 8vo. 4pp: 72pp:: 41 plates.
EDINBURGH: C. Elliot, 1787. 8vo. 4pp: 106pp:: 40 plates.
LONDON: 1788. folio. :: 40 plates.
EDINBURGH: 1790. 8vo.
EDINBURGH: 1792. folio.
WORCESTER, Mass.: I. Thomas, 1793. 8vo. 4pp: pp. 5-84:: 40 plates.
PHILADELPHIA: T. Dobson, 1797. 8vo. 5pp: pp. 6-98:: 40 plates.

SNAPE, Andrew

The anatomy of an horse . . . to which is added an appendix containing two discourses, the one of the generation of animals; and the other of the motion of the chyle, and the circulation of the blood.

LONDON: M. Flesher for the author, 1683. folio. 6 ll: 237pp: 45pp: 3 ll::
Portrait and 49 plates.

SPIGELIUS, Adrian 1578-1625.

'Αγγειολογια: or a description of the vessels in the body of man: of three kinds i. e. of the veins, arteries and nerves . . . . . translated out of the anatomy of Adrianus Spigelius.

LONDON: R. Cotes and W. Dugard, 1649. folio. 2 ll: 50pp: 1 l:: 4 plates.

Other editions.

LONDON: E. C., 1665. folio. 2 ll: 50pp:: 4 plates.

LONDON: M. Clark, 1678. folio. 2 ll: 44pp:: 4 plates.

LONDON: Jos. Hindmarsh, 1691. folio. 2 ll: 44pp:: 4 plates.

This item is contained in the above editions of PARE, Ambrose "The works of that famous chirurgeon Ambrose Parey," but has a separate title-page. The title-page of the 1691 edition bears the date 1678.

TAUVREY, Daniel. 1669-1701.

A new rational anatomy containing an explication of the uses of the structure of the body of man and some animals according to the rules of mechanics.

LONDON: For D. Midwinter and Tho. Leigh, 1701. 8vo.
5 p. l: 301pp: 4 ll:: 21 plates.

THOMPSON, George

The anatomy of the human bones; with an account of muscular motion and the circulation of the blood.

LONDON: for R. Ware, 1734. 8vo. 17 p. l: 299pp: 12 ll:: 15 plates.

—— Syllabus pointing out every part of the human system as shewn in the anatomical wax figure of the late M. Denoue: with a compendium of anatomy.

LONDON: 1739. 8vo. 2 ll: 36pp: 2 ll: 136pp.

—— See LYSER, M.

TURNER, Robert fl. 1640-1664.

ΜΙΚΡΟΚΟΣΜΟΣ. A description of the little-world. Being a discovery of the body of man, exactly delineating all the members, bones, veins, sinews, arteries, and parts thereof, from the head to the foot . . . . . etc.

LONDON: for John Harrison, 1654. 12mo.

TYSON, Edward 1649-1708.

Orang-outang sive homo sylvestris: or the anatomy of a pygmie compared with that of a monkey, an ape, and a man.

LONDON: for Thomas Bennet, 1699. 4to. 4 p. l: 108pp:: 8 plates: 58pp.

Another edition.

LONDON: T. Osborne, 1751. 4to. 6 p. l: 108pp:: 8 plates: 58pp:: 2 plates: 78pp:: 6 plates.

——Several anatomical observations.
LONDON AND OXFORD: 1705. folio.

TYTLER, James 1747-1805.

A compendious system of anatomy. In six parts . . . extracted from the American edition of the Encyclopaedia now publishing.

PHILADELPHIA: T. Dobson, 1790. 8vo. 104pp:: 12 plates.
The first anatomical work published in America.
Other editions.
PHILADELPHIA: T. Dobson, 1792. 8vo. 438pp:: 12 plates.
PHILADELPHIA: T. Dobson, 1805. 8vo. 8pp: pp. 9-419:: 12 plates.

VAUGHAN, Walter 1766-1828.

An exposition of the principles of anatomy and physiology . . . containing the Praelectiones anatomicae of F. Leber.

LONDON: G. J. and J. Robinson, 1791. 2 vols., 8vo. 32pp: 425pp. 5pp: 306pp.

VERDIER, Cesar 1685-1759.

An abstract of the anatomy of the human body, containing a short but exact . . . . description of all the parts which compose it. Translated from the original French by Dale Ingram, surgeon and man-midwife.

LONDON: J. Clarke and J. Hodges, 1753. 8vo.
7pp: (4 ll): 106pp: 89pp: 274pp.

VERDUC, Jean Baptiste, fils

A treatise of the parts of a humane body, with their respective uses . . . . . also a curious account of the organs of sensation, explaining their faculties. Now made English by J. Davis.

LONDON: W. Turner, 1704. 8vo. 10 p. l: 359pp: 13 ll.

VESALIUS, Andreas 1514-1565.

See DOUGLAS, James; GEMINUS, T.

VESLING, Johannes 1598-1649.

The anatomy of the body of man: wherein is exactly described every part thereof, in the same manner as is commonly shewed in publick anatomies . . . englished by Nich. Culpeper.

LONDON: P. Cole, 1653. folio. 7 p. l: 192pp: 28 ll:: 23 plates.
Another edition.
LONDON: George Sawbridge, 1677. folio. 3 p. l: 192pp: 24 ll:: 24 plates.

VICARY, Thomas 1490?-1561.

A profitable treatise of the anatomie of mans body: compyled by that excellent chirurgion M. Thomas Vicary, Seriaunt chirurgion to King Henry the eyght, to King Edward the vj, to queene Mary, and to our most gracious Soveraigne Lady Queene Elizabeth, and also cheefe chirurgion of S. Bartholomewe's Hospital. Which work is newly renyued, corrected and published by the chirurgions of the same Hospital now being An. 1577.

LONDON: Henry Bramforde, 1577. 12mo.

This is the earliest edition now extant. The original edition of 1548 although known to be printed is now completely lost.

—— The Englishman's treasure, or treasor for Englishmen; with the true anatomy of man's body.

LONDON: (1585?). 4to. 110pp.

Other editions.

LONDON: John Windet for John Perin, 1586. 4to. 5 p.l: 115pp.
LONDON: George Robinson for John Perin, 1587. 4to. :: 1 woodcut.
LONDON: T. Creede, 1596. 4to. 4 p.l: 110pp.
LONDON: T. Creede, 1599. 4to. 4 p.l: 110pp.
LONDON: T. Creede, 1613. 4to. 3 p.l: 224pp: 4 ll.
LONDON: B. Alsop & T. Fawcet, 1626. 4to. :: 1 woodcut.
LONDON: B. Alsop & T. Fawcet, 1633. 4to. 3 p.l: 264pp: 4 ll:: 1 woodcut.
LONDON: B. Alsop, and T. Fawcet, 1641. 8vo. 5 ll: 292pp: 8 ll:: woodcuts.
LONDON: F. Fawcet, 1651. 4to. 7 p.l: 332pp.

WAINWRIGHT, Jeremiah

An anatomical treatise of the liver with the diseases incident to it.

LONDON: for James Lacy, 1722. 8vo. 2pp: 100pp.

WALKER, John 1759-1830.

On the necessity for contracting cavities between the venous trunks and the ventricles of the heart: on the use of the venous sinuses in the head.

EDINBURGH: 1799. 12mo.

WARNER, Joseph 1717-1801.

A description of the human eye, and its adjacent parts.

LONDON: L. Davis, 1773. 8vo. 14pp: 108pp:: 2 plates.

WILLIS, Thomas 1621-1675.

Practice of physick, being all the medical works of that renowned and famous physician containing these ten several treatises, viz.: Of fermentation, of fevers, of urines, of the accension of the blood, of

musculary motion, of the anatomy of the brain, of the description and uses of the nerves, etc. . . . . done into English by S. P(ordage).

LONDON: for T. Dring, 1681. folio. 6 ll: 178pp: 2 ll: 192pp: 2 ll: 106pp: 15 ll: 12 ll: 155pp: 4 ll: 179pp: 56pp: 1 ll:: 30 plates.

Another edition.

LONDON: T. Dring, C. Harper, J. Leigh, 1684. folio. 12 p. l: 178pp: 192pp: 106pp: 143pp: 160pp: 234pp:: 29 plates.

These items contain the English translation of his "Cerebri Anatome."

WINSLOW, Jacob Benignus 1669-1760.

An anatomical exposition of the structure of the human body . . . Translated from the French original by G. Douglas, M. D.

LONDON: Vol. I for A. Bettesworth, 1734. 4to. 20pp: 152pp: 182pp.
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Other editions.

LONDON: R. Ware, 1743. 4to. 24pp: 334pp: 4pp: 355pp:: 4 plates.

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LONDON: R. Ware and J. Knapton, 1756. 4to.
24pp: 334pp: 5 ll: 355pp: 3 ll:: 4 plates.

LONDON: J. Knapton, 1763. 4to. 24pp: 334pp: 4pp: 355pp: 7 ll:: 4 plates.

EDINBURGH: A. Donaldson, 1763. 4to. 28pp: 411pp: 10pp: 450pp:: 4 plates.

EDINBURGH: Donaldson and Elliott, 1772. 4to.
32pp: 427pp: 10pp: 468pp:: 4 plates.

LONDON: J. and F. Rivington, 1776. 4to.
24pp: 334pp: 5 ll: 335pp: 4 ll:: 4 plates.

WINSTON, Thomas 1575-1655.

Anatomy lectures at Gresham Colledge.

LONDON: R. Daniel, 1659. 12mo. 3 p. l: pp. 3-256.

——The compleat anatomist. Being a compendious treatise of the anatomy or dissection of the body of man. Containing a description of the parts thereof methodically digested.

LONDON: for William Jemson, 1664. 8vo.

ACKNOWLEDGEMENT

This list has been compiled over a number of years from the catalogues of libraries, both private and public, from the catalogues of innumerable booksellers, and from the results of considerable personal browsing and therefore it is difficult to know where and to whom to tender thanks.

Without the catalogue of the Surgeon-General's Library this list would not have been as complete as it is.

Grateful thanks are due to Professor F. Wood Jones, the Sir William Collins Professor of Anatomy at the Royal College of Surgeons of England and to W. R. Le Fanu, Esq., Librarian of the College for checking through the typescript and making many valuable suggestions and additions.

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MEDICO-HISTORICAL NEWS AND ACTIVITIES

THE JOHNS HOPKINS INSTITUTE OF THE HISTORY OF MEDICINE

Dr. Richard H. Shryock has been appointed William H. Welch Professor of the History of Medicine and Director of the Institute of the History of Medicine at the Johns Hopkins University.

NATIONAL NEWS

History of Science Society Meeting

The 1949 meeting of the History of Science Society will be held in conjunction with the annual meeting of the American Historical Association at Boston, Mass., late in December. Plans are now being made for the program, and members of the Society interested in submitting papers for consideration should communicate with the Chairman of the Program Committee, Professor Henry E. Guerlac, Cornell University, Ithaca, N. Y. No papers can be considered after October 1, 1949.

Michigan

The Wayne County Medical Society was established in Detroit in April, 1849. On the occasion of its centennial celebration, the Society brought out a booklet, *A Golden Century of Medicine*, by Henry B. Selleck.

It was also in Detroit that the first annual meeting of the American Association of Industrial Physicians and Surgeons was held on June 12, 1916. The Program of this meeting has been reproduced in commemoration of the incorporators of the Association to whom tribute was paid at the Annual Banquet of the Association in Detroit on April 7, 1949.

Vermont

A history club has been organized by a group of students and faculty of the College of Medicine of the University of Vermont at Burlington, Vermont. Two meetings have been held this year during which a name and constitution were adopted and five papers read. The name adopted at the second meeting was "Surgeons of the Short and Long Robe." At the same time the constitution and by-laws were ratified subject to the approval of the University's committee on student activities.

The papers presented included:

April 8, 1949: Laurence Ballou: "Grave Robbing in Vermont."
Edward A. Kamens: "History of the Fanny Allen Hospital"
Llewellyn M. Jones: "History of the Enema"

May 27, 1949: James P. Burke: "The Agent Sending System in Vermont"
Robert M. True: "History of the Induction of Hypnosis"

Four meetings are planned for the academic year 1949-50 as there is a backlog of available papers and an apparent enthusiasm on the part of both students and faculty.

Personalia

During a short trip through the United States, Dr. Douglas Guthrie, Lecturer on History of Medicine at the University of Edinburgh, gave the following lectures:

April 12, 1949, before the Johns Hopkins Medical History Club:
"The Patient: A Neglected Factor in Medical History."

April 15, 1949, before the College of Physicians of Philadelphia:
"The Philosophical Basis of Medicine."

April 19, 1949, before the New York Academy of Medicine:
"The Rise and Progress of Medical Education in Scotland."

* * *

Mr. L. K. Eaton, a candidate for the Ph. D. in the History of American Civilization at Harvard University, is working on a doctoral thesis entitled: *Hospital Development in New England, 1790-1830.* Mr. Eaton would be happy to hear from other scholars in the field of hospital history.

NEWS FROM ABROAD

Denmark

Dr. Edv. Gotfredsen has been elected professor of the history of medicine at the Copenhagen University.

Scotland

The following series of lectures on "The Historical Approach to Medicine" will be delivered by Dr. Douglas Guthrie at the University of Edinburgh during the Summer Term, 1949:

May 2. "The Value of History in Medicine"
May 9. "The Pre-history of Medicine"
May 16. "Maya and Inca Medicine"
May 27. "Greek and Roman Medicine"
May 30. "Salerno: the First Medical School"
June 6. "The Renaissance and Its Teaching"
June 13. "The Microscope: Origin and Evolution"
June 20. "The Early Days of the Edinburgh Medical School"

FRANS JONCKHEERE. *Autour de l'autopsie d'une momie. Le scribe royal Boutehamon.* Bruxelles: Edition de la Fondation Egyptologique Reine Elisabeth, Parc du Cinquantenaire, 1942. 138 pp., 60 ill.

FRANS JONCKHEERE. *Une maladie égyptienne; L'hématurie parasitaire. Ibid.*: 1944. 64 pp. (La médecine égyptienne, No. 1.)

FRANS JONCKHEERE. *Le papyrus médical Chester Beatty. Ibid.*: 1947, 80 pp., 1 plate. (La médecine égyptienne, No. 2.)[1]

Frans Jonckheere, like B. Ebbell, is a physician who became an Egyptologist and thus combines philological and medical knowledge. It is extremely important to have some physicians well trained in language, literature and archaeology of the various civilizations of the East, because the philologist will find it difficult to understand and evaluate technical texts. This is generally admitted in the case of mathematics and astronomy, but obviously applies to medicine also. Nobody will underestimate the great contributions made by Georg Ebers, James H. Breasted, Walter Wreszinski, H. Grapow and many other philologists to our knowledge of Egyptian medicine, but their interpretations were limited by the fact that they were not familiar with the subject matter of the texts under examination.

In the case of Mesopotamia, we are fortunate in having in Dr. G. Contenau, a leading French Assyriologist who is a physician at the same time.[2] His latest books are extremely important for our knowledge of Assyro-Babylonian medicine.[3] We still badly need physicians well trained in Sanscrit, Chinese and Arabic philology. There are enough doctors whose mother tongue is Chinese or Arabic, or Persian, but usually they are so busy with urgent practical problems that they have not the time for historical studies, and few of them are familiar with their classical literature and equipped to investigate a 9th or 10th century text critically. It will not be easy to fill the gap left by the death of Max Meyerhof in the field of Arabic medicine, but it is the duty of the departments of medical history of our universities to steer young people into these studies where so much remains to be done.

A few years ago Jonckheere wrote a brilliant short article in which he particularly emphasized the importance of non-medical texts for our knowledge of medical conditions in ancient Egypt, a point in which I wholeheartedly agree with him.[4]

[1] The three pamphlets together were sold in Switzerland for 34.– Swiss francs or about $8.50.

[2] He is at present Honorary Conservator in Chief of Oriental Antiquities at the Louvre in Paris and Professor at the University of Brussels.

[3] *La civilisation d'Assur et de Babylone*, Paris: Payot, 1937.—*La médecine en Assyrie et Babylonie*, Paris: Maloine, 1938 [see this *Bulletin*, 1947, 21: 124].—*La divination chez les Assyriens et les Babyloniens*, Paris: Payot, 1940.—*La magie chez les Assyriens et les Babyloniens*, Paris: Payot, 1947.

[4] F. Jonckheere, Coup d'oeil sur la médecine égyptienne; l'intérêt des documents non médicaux. *Chronique d'Egypte*, 1945, 20: 24-32.

Today it is a pleasure to review three pamphlets on various subjects of Egyptian medicine published during and after the war, two of which mark the beginning of a series which, we hope, will include many more numbers.

The first study is devoted to the systematic examination of a mummy of the XXIst Dynasty from the necropolis of Thebes. When we perform an autopsy today it is usually in order to ascertain the cause of death of an individual. In the case of the royal scribe Boutehamon it was impossible to find from what disease he had died 3000 years ago because all internal organs had been removed by the embalmers. Nor did the autopsy reveal any facts that could be considered in any way new. The value of this publication lies in the thorough description and discussion it gives of the methods that must be employed in the study of such material, beginning with a complete roentgenological examination of the mummy before it has been unwrapped. Flinders Petrie was the first who x-rayed a mummy as early as 1898, only three years after Roentgen's discovery. Techniques have been tremendously developed since then, and this study with its excellent illustrations shows how much can be seen on the screen or on the film before a mummy has even been touched.

The next step is the unwrapping of the mummy which reveals how highly developed the art of bandaging the body was among the Egyptians. Then follows the examination of the denuded body, macroscopic, microscopic and possibly also serological. On account of its thoroughness this publication has become a regular manual that every one will consult with benefit who ever has to examine mummies whether they be Egyptian or American.

The second pamphlet is devoted to the critical discussion of the aaa disease about which much has been written ever since H. Brugsch's early publication on Egyptian medicine of 1853.[5] The disease is mentioned not less than 50 times in the medical literature preserved (Ebers: 28, Berlin 3038: 12, Hearst: 9, London: 1). Jonckheere gives a translation with commentary of all these passages and then proceeds to the identification of the disease. G. Scheuthauer in an otherwise somewhat fanciful interpretation was the first to attribute it in 1881 to a parasitic worm[6] which for a long time was believed to have been the hookworm, so that the disease would have been the "Egyptian chlorosis." In 1913 E. Pfister in a well-known paper[7] expressed the opinion that the disease was schistosomiasis, the Bilharzia disease which is also very frequent in Egypt today and did occur in antiquity as we know from palaeopathological findings.[8] Ebbell then in 1927 came to the conclusion that the word aaa did not designate the disease as a whole but its chief symptom, namely *hematuria*. This also explains why the phallus is used as determinative of the word. Jonckheere accepts this interpretation and elaborates on it, pointing out that cardiac and abdominal symptoms of the disease had not escaped

[5] H. Brugsch, Ueber die medizinischen Kenntnisse der alten Aegypter . . . *Allg. Monatsschr. f. Wiss. u. Lit.*, 1853, 44-56.

[6] G. Scheuthauer, Beiträge zur Erklärung des Papyros Ebers . . . *Virchows Archiv*, 1881, 85: 343-354.

[7] Edwin Pfister, Ueber die aaa-Krankheit der Papyri Ebers und Brugsch, *Arch. Gesch. Med.*, 1913, 6: 12-20.

[8] See M. A. Ruffer, *Studies in the palaeopathology of Egypt*, Chicago, 1921, pp. 18-19.

the attention of the Egyptian physicians. The treatment as described in these 50 recipes is confused. A great variety of vegetable, animal and mineral drugs was given, a fact that shows that there was no effective and generally accepted way of curing the disease. Antimony is mentioned once (Hearst, Nr. 83). Today a trivalent organic antimony compound given in 6.3 per cent solution and known as fuadin or stibophen is the best remedy known so far.

It had been said that circumcision and the wearing of condoms were practised by the Egyptians as prophylactic measures to prevent the parasite from entering the urethra. Jonckheere shows how wrong these views were. Quite apart from the fact that the parasite does not enter through the urethra but anywhere through the skin, circumcision was a religious rite here as anywhere else and the Karnata, the kind of phallus sheaths that the Egyptians sometimes are found to be wearing on pictures, were a matter of decoration and nothing else.

The third pamphlet, recently issued, is by far the most important of the lot, as it contains the first translation into any modern language of a medical papyrus which was published with hieroglyphic transcription by Alan H. Gardiner in 1935.[9] It is a fragment of a monograph on *Remedies for Diseases of the Anus*. Written at the time of the XIXth or XXth Dynasty, that is, in the 13th or 12th century B. C., it consists of 8 columns of 14 lines each. Beginning and end are missing and we do not know how long the book originally was. There is no doubt, however, that the text is considerably older than the present copy. This is the type of monograph which we find incorporated in Papyrus Ebers. It is interesting to have such a book because we know that there was a medical specialist who was designated as *Guardian* or *Shepherd of the Anus*[10] and this book tells us what kind of medicine he practised. It has no description of disease in the style of Papyrus Edwin Smith or of certain sections of Payprus Ebers[11] but contains 41 recipes, one of which only is duplicated in Papyrus Ebers.[12] Their structure follows traditional lines, having a title that names the disease, such as *remedy to remove the inflammation of the anus* (23), a remedy *to refresh the heart and refresh the anus, to remove all its heat* (16); then comes the list of drugs with doses, followed by indications for the preparation of the remedy and instructions for its application. The medicaments were either to be taken *per os* or as suppositoria or as enemas. The Egyptians made as much use of enemas as the contemporaries of Molière, and there was not a liquid from oil to milk to beer that they did not absorb *per rectum*. Enemas were usually from one to three pints and contained all kinds of mild drugs so that the intention was rather to have them kept and absorbed than to have them cause an evacuation. Combined treatments were frequent: a potion was given on four consecutive days and was followed each time by the application of a certain enema.

[9] *Hieratic papyri in the British Museum, Chester Beatty Gift*, London, 1935. Of this collection of papyri ours is No. VI (Papyrus 10,686 of the British Museum).

[10] See H. Junker, Die Stele des Hofarztes Irj, *Zschr. ägypt. Sprache*, 1928, 63: 66-67; J. E. Quibell, *Excavations at Saqqara*, 1905-1906, vol. I, pl. XIV.

[11] With one exception, No. 12, which has a brief description of a disease with diagnosis and favorable verdict.

[12] Chester Beatty No. 26—Ebers No. 157, p. 33.

Remedies for the anus occur frequently in Papyrus Ebers and are encountered also in the Papyri Hearst and Berlin. The diseases described are often vague. The anus is sick, or hot, or heavy, or itching, or painful, or bloody, or its vessels have to be quieted, or it threatens to prolapse. Particularly numerous are the remedies *to refresh the anus*, and while I read the text I was wondering whether there was in Egypt as much homosexual intercourse between men in antiquity as there is today.[18] This might partly explain the great attention paid to this organ and the rather unusual fact that it became the object of a specialty of its own.

Jonckheere's translation has a detailed philological commentary and is followed by an exhaustive study of the diseases of the anus and their treatment in this and in other papyri. This is a most welcome publication which enriches our knowledge of Egyptian medicine quite considerably.

It should be added that these like all other publications of the Fondation Egyptologique Reine Elisabeth are printed and presented in the most excellent taste.

HENRY E. SIGERIST

HAROLD WILLIAM RICKETT. *The Royal Botanical Expedition to New Spain.* Waltham, Mass.: the Chronica Botanica Co., New York: Stechert-Hafner, Inc., 1947. [Chronica Botanica, Vol. 11, No. 1, pp. 1-86, illustrated.] $2.50.

From its inception the imperial government of Spain displayed an interest in scientific matters unusual among the absolute monarchies of the time. Despite inevitable emphasis on the applied and practical aspects, pure or theoretical science was by no means neglected. The world is thoroughly acquainted with the revolution in cosmography following the explorations of Columbus and many others, but equally important were the advances in knowledge brought about in less spectacular fields through the efforts of the Spanish crown.

Much curiosity was always displayed with respect to the New World possessions, curiosity which appears to have transcended the need for merely economic or political information. Thus the famous *interrogatorios* of the sixteenth century, transmuted into the form of *relaciones* have preserved for posterity valuable accounts concerning the pre-history, ethnography and biology of Latin America. Throughout the early and middle colonial period a constant stream of reports flowed across the Atlantic to the home government which, collectively, provide us with an excellent picture of scientific progress in the New World.

In addition to incidental, routine acquisition of data, the Spanish monarchs occasionally initiated active research projects. Among these was the Royal Botanical Expedition of 1788 to 1820. Undertaken at the very close of Spanish domination in America, its purpose was to "collect, identify and methodically describe the natural productions of the three Kingdoms of Nature" as well as to found a botanical garden and provide a permanent curriculum of study in the subject. Thus began, in 1788, a series of collecting expeditions and courses of instruction which not only materially advanced our knowledge of the Mexican flora but also created

[18] See in this connection von Oefele's article in *Monatsschr. f. prakt. Dermatol.*, 1898, 29: 409.

a biological tradition which even yet persists. We are indebted to Dr. Rickett for his service in making available to modern readers the details of this scientific accomplishment.

Since the Spanish government was both politically impotent and financially bankrupt, its efforts consisted essentially in setting up the project on paper and transmitting the appropriate orders to the colonial authorities in New Spain. Neither the king nor his viceroy possessed the means with which to afford proper financial support. Moreover, the local officials frequently lacked even academic interest in the expedition. The participants, therefore, were constantly forced to operate against a background of incompetence and petty obstructionism. Their achievements were always at the cost of great personal sacrifice.

Another basic defect in organization was that the political government insisted upon immediate and complete control of personnel. Having set up what amounted to a group investigation, and having selected in Sessé a very learned and competent chief, the viceroy and his advisers refused to permit the latter to select his own subordinates. As a result, internal controversies developed, based upon conflict of personalities and downright individual incompetence which detracted greatly from the scientific effectiveness of the undertaking. No better insight can be obtained into some of the perils of "group research" than by the perusal of Dr. Rickett's account.

Since under the then existing bureaucracy every tiny quarrel and every minute administrative problem had to be settled in writing through the head of the state himself, it is inevitable that the basic documentary file (in the National Archive of Mexico) should emphasize unimportant matters and personal polemic. Indeed, the author is to be complimented upon the effective manner in which he has selected and organized his documentary sources so as to produce a coherent and comprehensive narrative. If one is inclined to wish that more space could have been devoted to the broad scientific significance of the expedition, rather than to biographical detail he must remember that the author was rigidly limited by his sources. Moreover, it is clear that Dr. Rickett was as deeply interested in the expedition for its administrative problems as for its contributions to botanical science.

It is noteworthy that most of the biological writings produced in New Spain throughout the era prior to 1820 present a strong slant toward medicine. The early chronicles, such as that of Sahagun, invariably emphasize the medicinal uses of the flora and fauna. The great work of Hernandez in describing Mexican plants was justified at the time as a contribution to therapeutics. All this is quite understandable in view of the emphasis placed by mediaeval medicine on the herbalistic philosophy. But it is obvious from Dr. Rickett's monograph that even at the end of the eighteenth century the old association between systematic botany and medical practice still persisted. Thus the very participants in the expedition were medically oriented. Sessé was an army physician, Senseve a pharmacist, Cervantes a pharmacist, Longinos a biologist, and Mociña a physician. On the other hand, after Cervantes had become established as instructor of botany, five eminent members of the medical faculty at the University came to him for private tutoring in the subject. Finally, the close affiliation of the two sciences was recognizezd in the regulations governing the establishment of the botanical garden according to which

". . . the combined purposes of the Royal Botanical garden are the instruction of professors of medicine, surgery and pharmacy and the collection of plants useful to the art of healing. . . ."

Latin America still continues a virgin field for the study of the history not only of medical and biological science, but of the physical and earth sciences. The archives in Mexico City, Bogota, Rio de Janeiro, Lima and Buenos Aires, not to mention the great Archive of the Indies at Seville, contain a vast store of interesting and significant material. Dr. Rickett has exploited one small incident and has thereby demonstrated the possibility of almost unlimited future investigation.

S. F. Cook

Vladimir C. Asmous. *Fontes Historiae Botanicae Rossicae.* Waltham, Mass.: the Chronica Botanica Co., New York: Stechert-Hafner, Inc., 1947. [Chronica Botanica, Vol. 11, No. 2, pp. 87-118, illustrated]. $1.25.

This is a bibliography of sources pertaining to the history of botany in Russia. The author, who began his career in the army of czarist Russia, has found solace for subsequent turns of fate by working in American libraries where he has become a skilled bibliographer, especially in the botanical literature written in his mother tongue. He had long worked with the assistance of Dr. E. D. Merrill, director of Harvard's Arnold Arboretum, to whose *Bibliography of Eastern Asiatic Botany* (published in 1938) he lent his knowledge of slavic languages. The present study Mr. Asmous undertook at the request of Dr. F. Verdoorn, editor of the *Chronica Botanica.*

The bibliography itself occupies some twenty pages cataloging authors and their publications (the Russian titles Asmous obligingly gives both in transliteration and in English translation). Many items are general studies, such as Lavrenko's *Steppes of USSR* (in Russian), of which a historical sketch of steppe investigations forms but a small part. Many items, too, are cited either because they are themselves bibliographies or because they contain sizable bibliographical lists which, insofar as they touch upon Russian botanists and their work, constitute useful material to the historian of Russian plant study.

This compilation is well ordered and is accompanied by helpful annotations, comments by the author printed in italics. A convenient subject index concludes the *Fontes* and is divided into three parts: (1) bibliographies, (2) biographies, and (3) history and progress of botany. Mr. Asmous has given much attention to the biographies of Russian plant students, and he is at present working upon a biographical dictionary of Russian botanists of the past.

George Raynor Thompson

ALFRED E. COHN. *No Retreat from Reason, and Other Essays.* New York: Harcourt Brace and Company, 1948. xi + 279 pp. $3.50.

Some of these essays are old (previously published in *Medicine, Science and Art: Studies in Interrelations*, University of Chicago Press, 1931) and some are new; "the old ones have been much rewritten and modernized." A comparison with the older book shows that this process, like the racking of wine, has resulted in greater clarity and brilliance. It shows also the effect of unhasting rumination in strengthened argument, thoughtful footnote, fresh and pertinent fact.

Of the eleven essays, old and new, the longest is a charming and reflective "spiritual autobiography," "Apologia Mea," which treats very briefly of the external incidents of Dr. Cohn's life but examines with insight and candor the influences which have marked his thought, given it its shape and drive. The title piece is a plea for a more extensive, and more intensive, application of scientific thought, for the exercise of more reason. He believes it is "unwise to restrain science until we learn how to restrain men," and argues cogently in defense of basic values currently under attack. "On Retiring" is a wise and witty discourse, which will probably be taken seriously where it is meant in fun, and laughed over as clever spoofing where it is obviously quite serious.

"If science, and the method of science, is not a way of life," writes Dr. Cohn, "it is at least a way of looking at nature." For Alfred E. Cohn, as for few others, it seems also a way of looking at much else. "The Influence of Modern Science on Painting and Sculpture" is a penetrating comment, shot from an unlooked-for direction, on modern tendencies in the plastic arts. Throughout the book the "toughmindedness," which the author admires as a necessary component of the scientific intellect, has never relaxed into mere kindliness or wishfulness yet it co-exists with a pervading warmth. It is therefore no surprise to find that his vision has not been bounded by the walls of laboratory or clinic. He is conscious of the many factors which affect science from without, and credits his extended awareness to Hessen's "The Social and Economic Roots of Newton's *Principia*"; it is clear that this was only the starting point. "The Meaning of Medical Research," to choose perhaps the best example, has gained in perspective and insight as a result of this approach.

There are also shrewdly drawn profiles (John Wyckoff and Simon Flexner) and brief chapters in the history of medicine ("Changes in Public Attitudes toward Medicine: Historical Aspects"; "The Development of the Harveian Circulation"). Here we make the acquaintance of a gifted historian, although the paper on "Public Attitudes" does not quite live up to the promise of its title.

This short book is so tightly packed with stimulating thought and unobtrusive learning that it is hard to suggest its quality in a brief review. "From [Professor James Harvey] Robinson," we are told, "one could learn that for an *educated man* nothing need be alien, that everything could be naturally at home." If Robinson conveyed this lesson more effectively than his pupil, Dr. Cohn, he was a great teacher indeed.

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